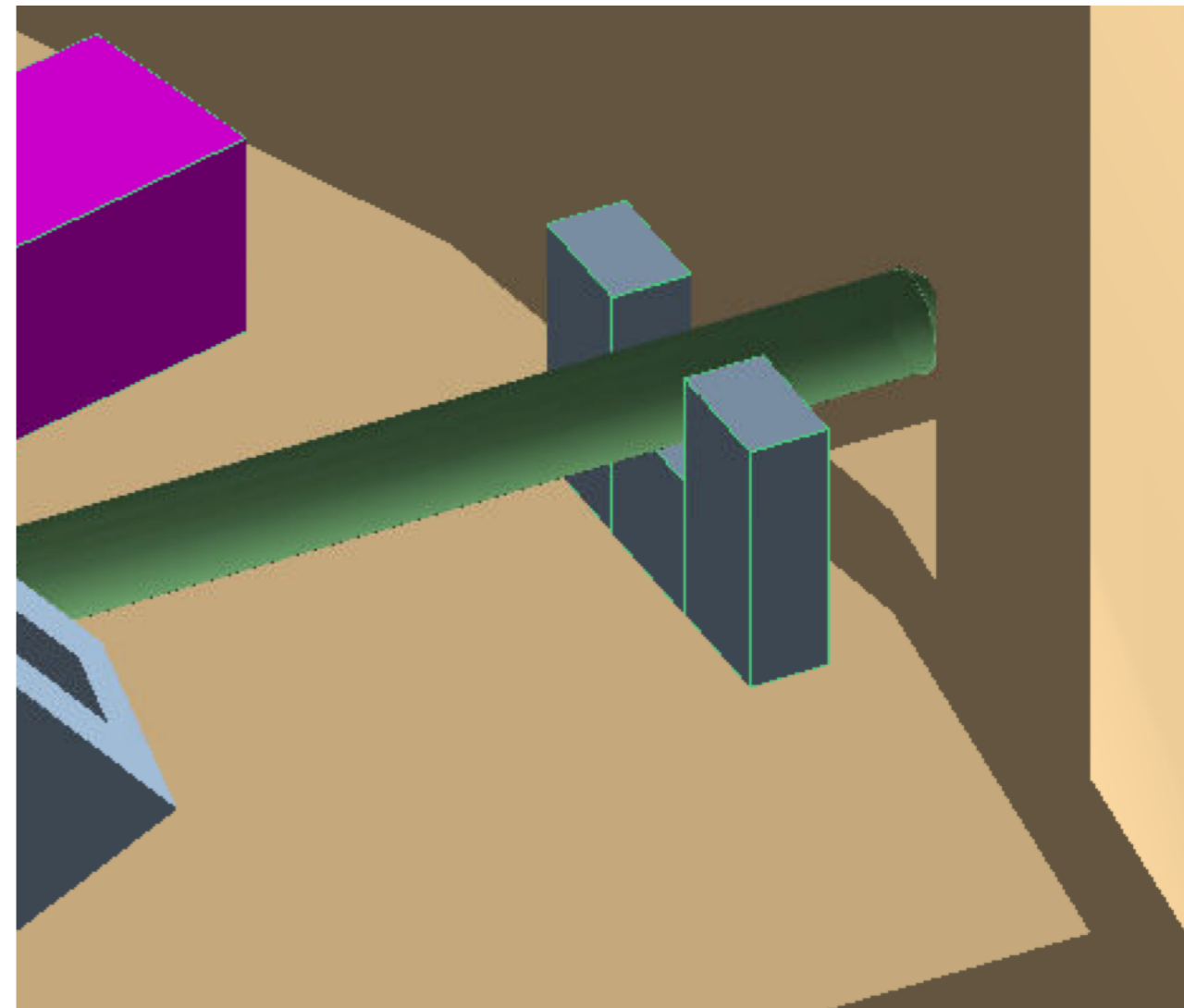
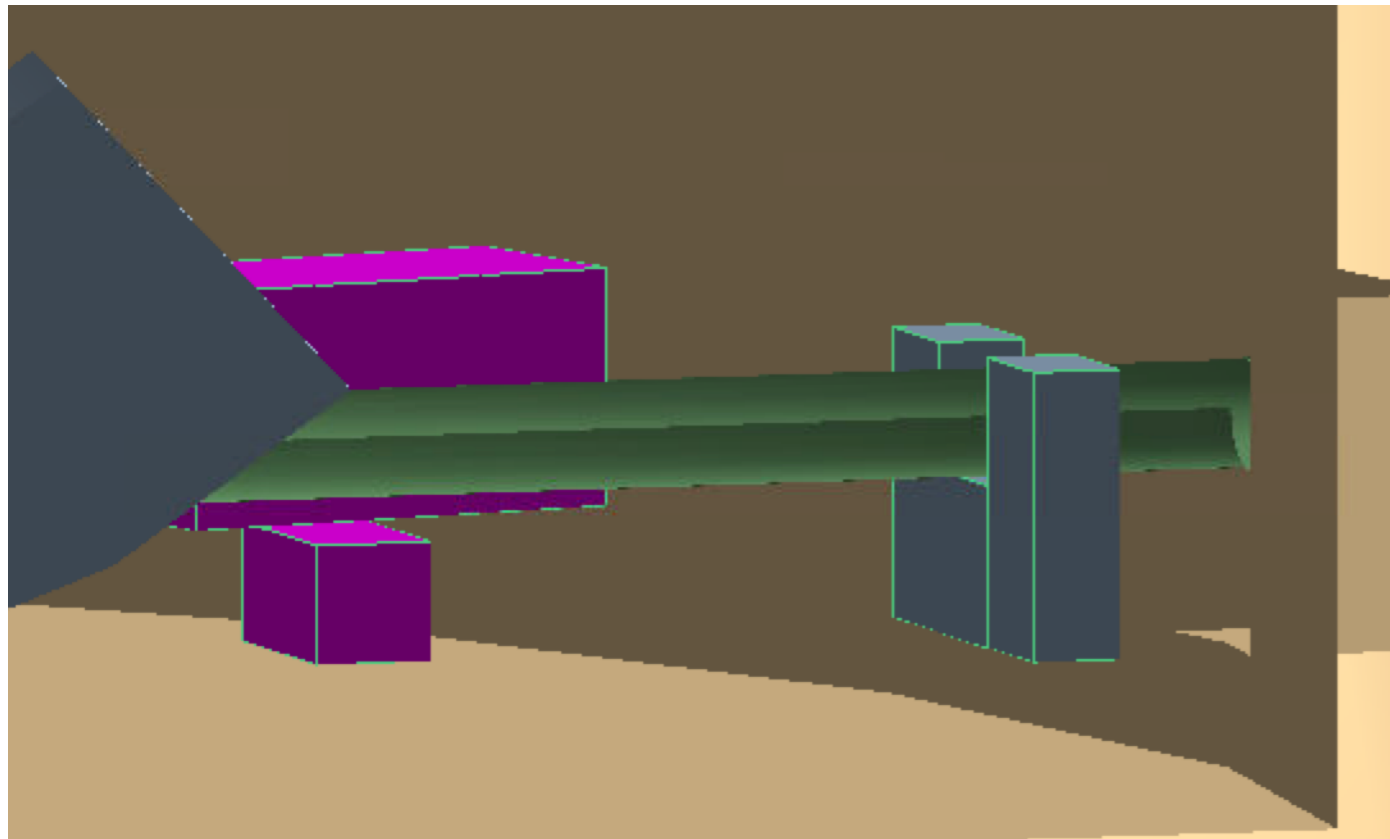


PREX Dump configuration

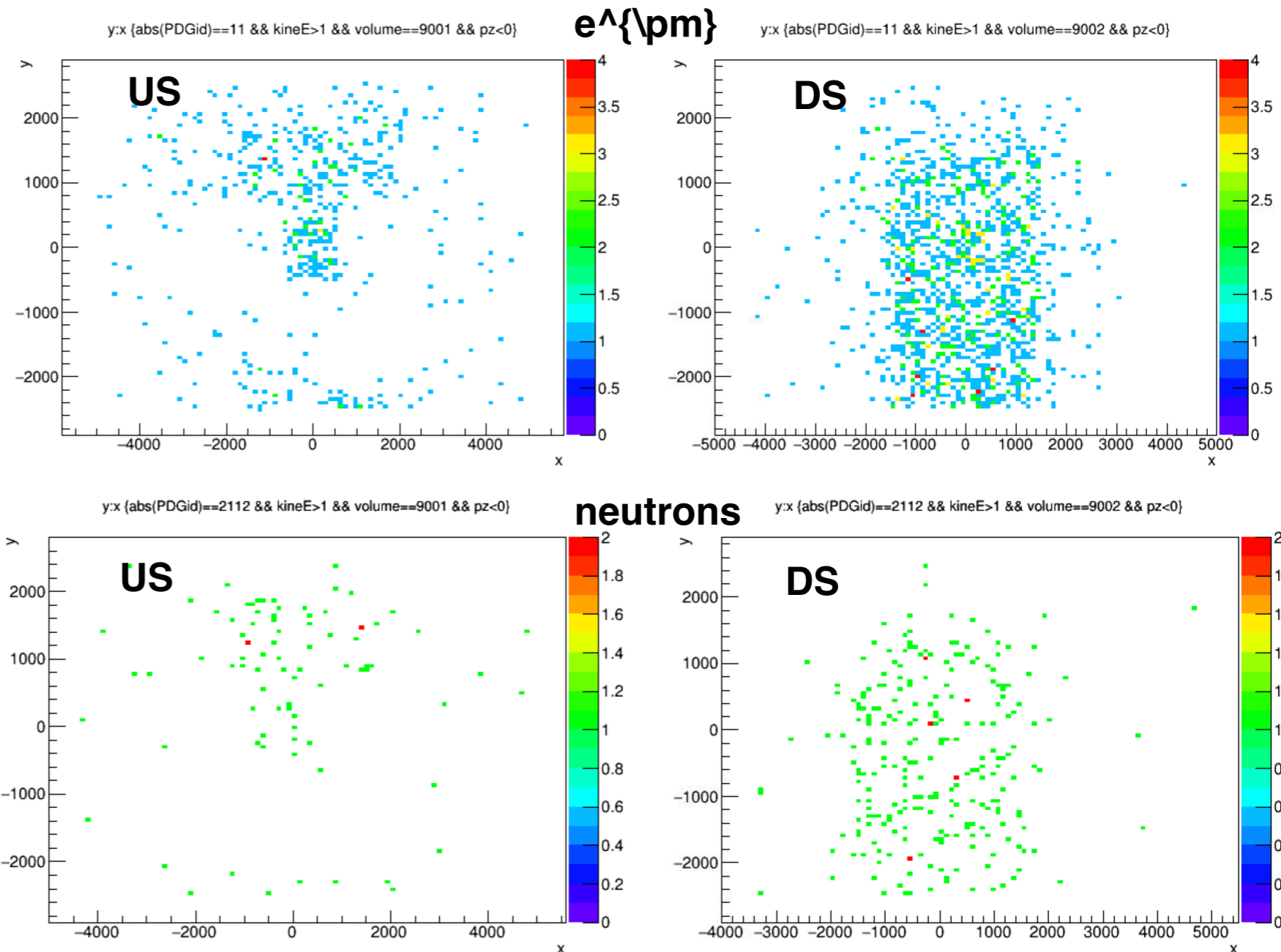
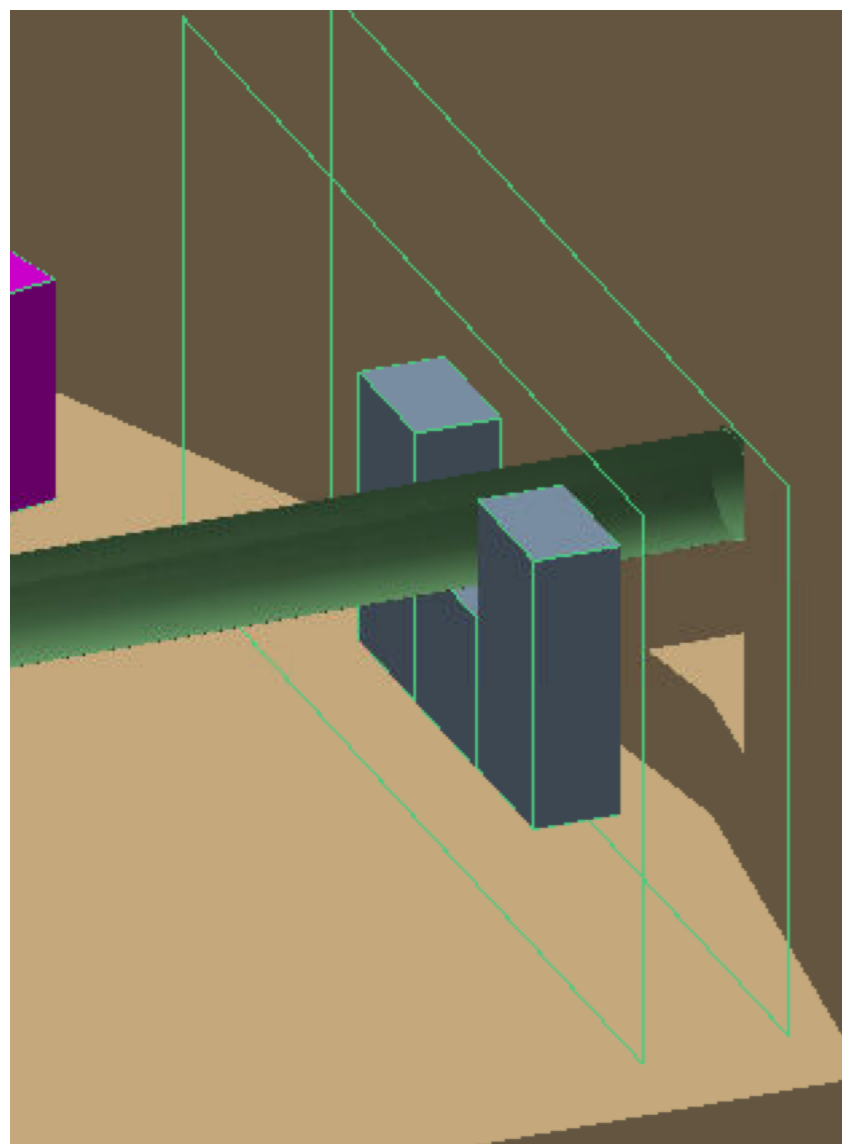
Ciprian Gal
UVa

CREX 2ft Iron shield



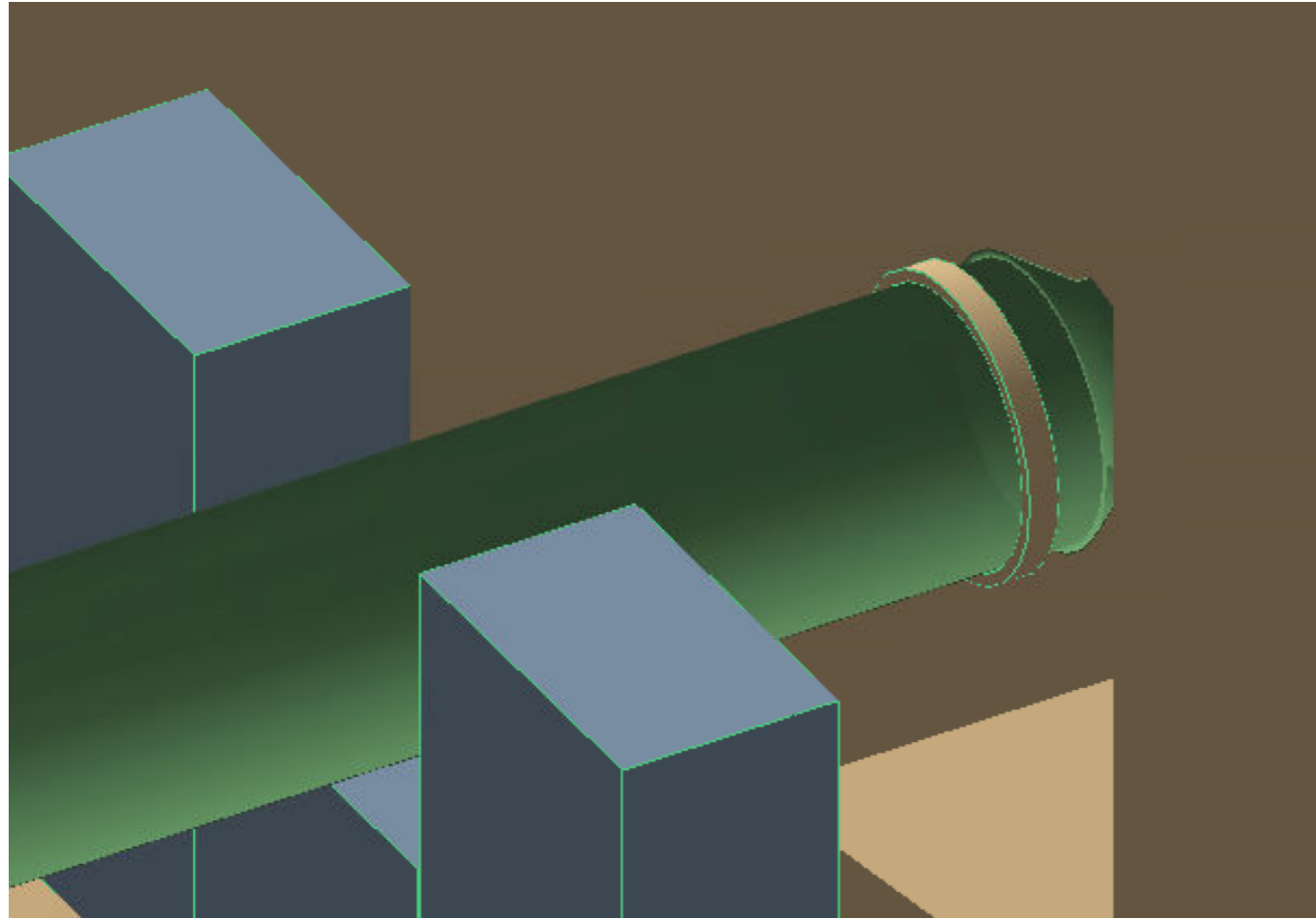
- The hall has some ~2ft thick iron/steel shielding which could be repurposed as shielding for us
- the shielding was moved 50 cm upstream to accommodate the existing infrastructure in the hall
- For CREX we get a total radiation dose of ~40% (vs 10%) PREX1

CREX 2ft Iron shield - US/DS detector



- I put 2 flat detectors in front and after the shielding to look what regions to optimize the size and position
- We can clearly see the reduction of both e and n in the US detector (particles moving towards the center of the hall)
- Will have to look which of these hits get to the HRS platform

CREX 2ft Iron shield - donut shield



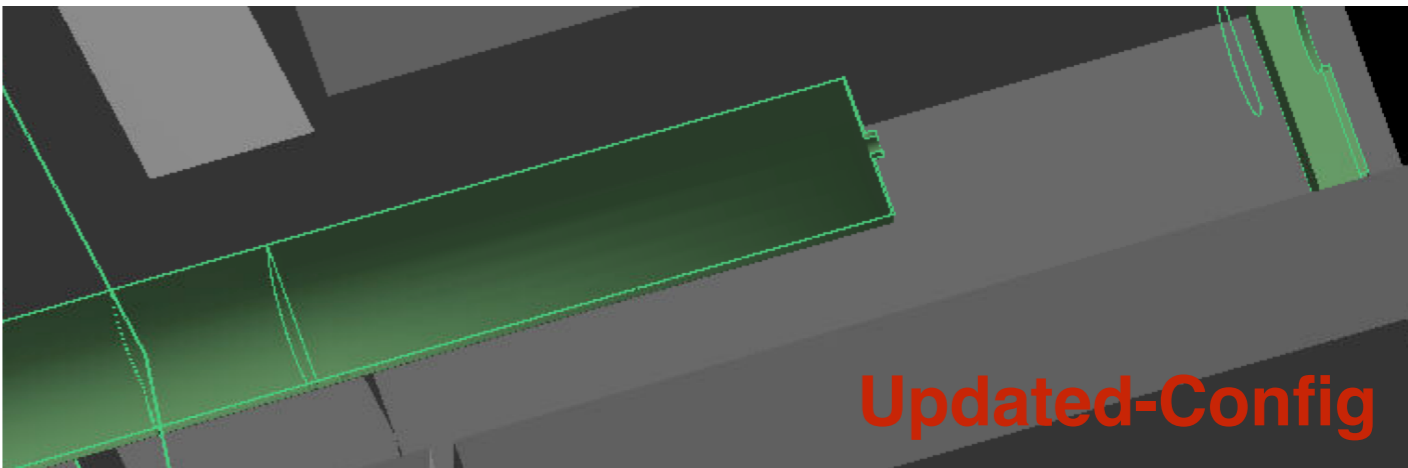
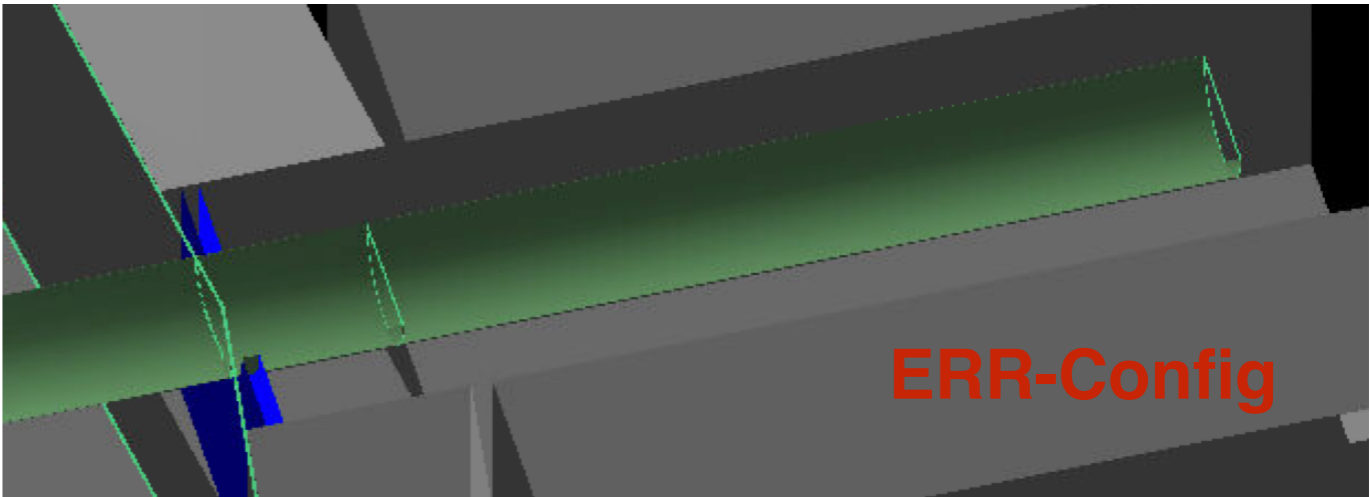
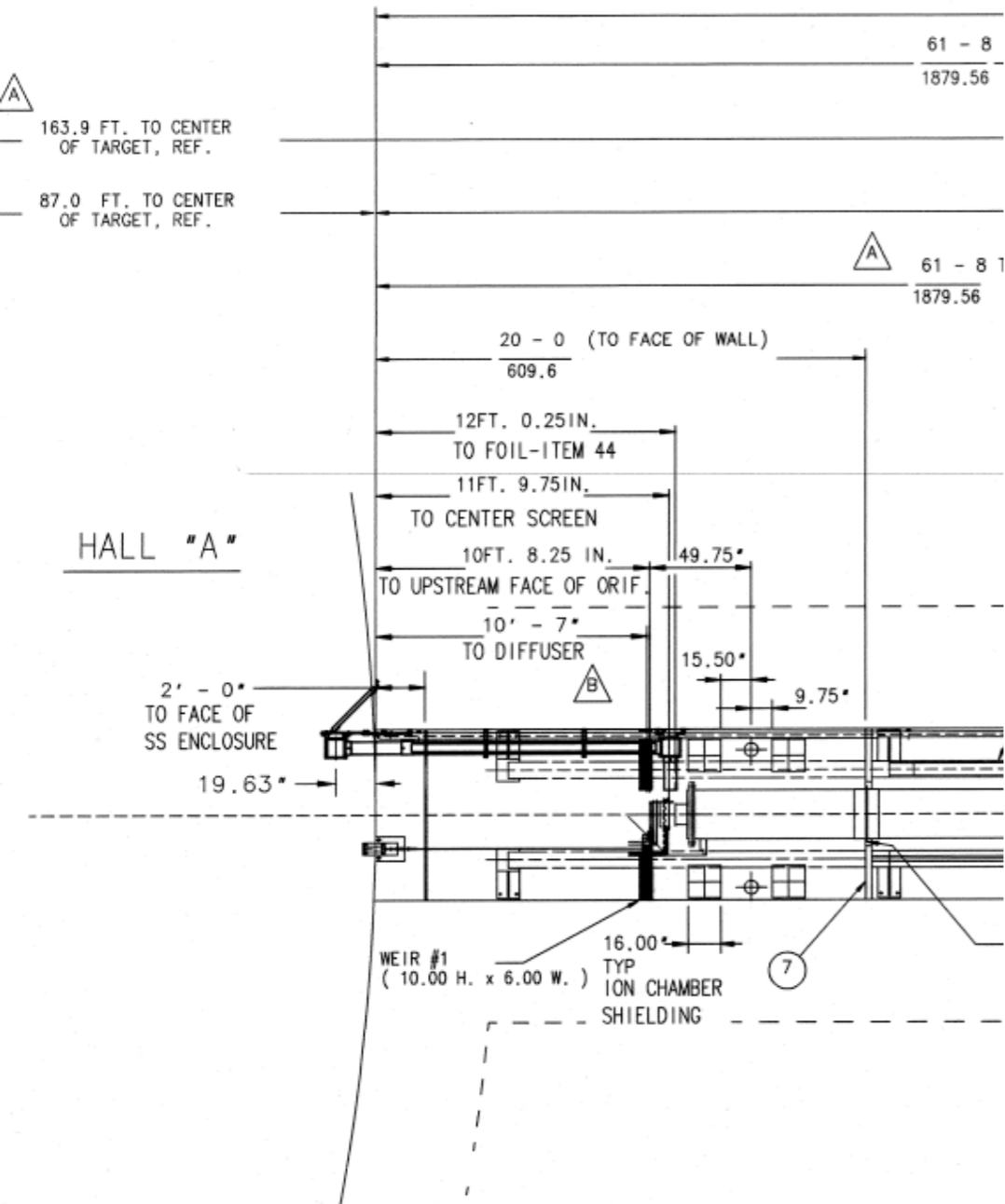
- Tungsten donut close to the neck down
 - $R_{in}=46\text{cm}$, $R_{out}=50\text{cm}$, $z=10\text{cm}$
- With the 2 ft Iron shield we get 51% γ 10% PREX1 radiation (consistent with previous result without the donut)
 - Looking at the hits in the shielding detectors doesn't show a significant different in either electrons or neutrons
- similar analysis was done with a Poly donut (see backup slides) and there was no difference in the radiation dose

Next steps

- Finish corresponding PREX calculations
- Add statistics to most of these simulations
- Include more geometry from the HRS platform (partial shielding)
 - redefine the electronics boxes
- Have vacuum in the beam pipe
 - currently we have air, which would cause the beam to blow up more — could be a large effect since 2500 cm of air have about $2500/30400 \sim 8\%$ radiation length
- Change the collimator angle to hide the knockdown

PREX 1 radiation estimation

Hall A dump configuration from Keith W. for 2010:



- PREX 1 estimates were done with a rudimentary dump configuration (most of the radiation to electronics came from within the hall proper)
 - The splash back from the dump was simulated by putting a stainless steel wall at the entrance of the dump tunnel
- The updated configuration with 4in aperture and the Al wall produced similar levels of radiation to the HRS platform

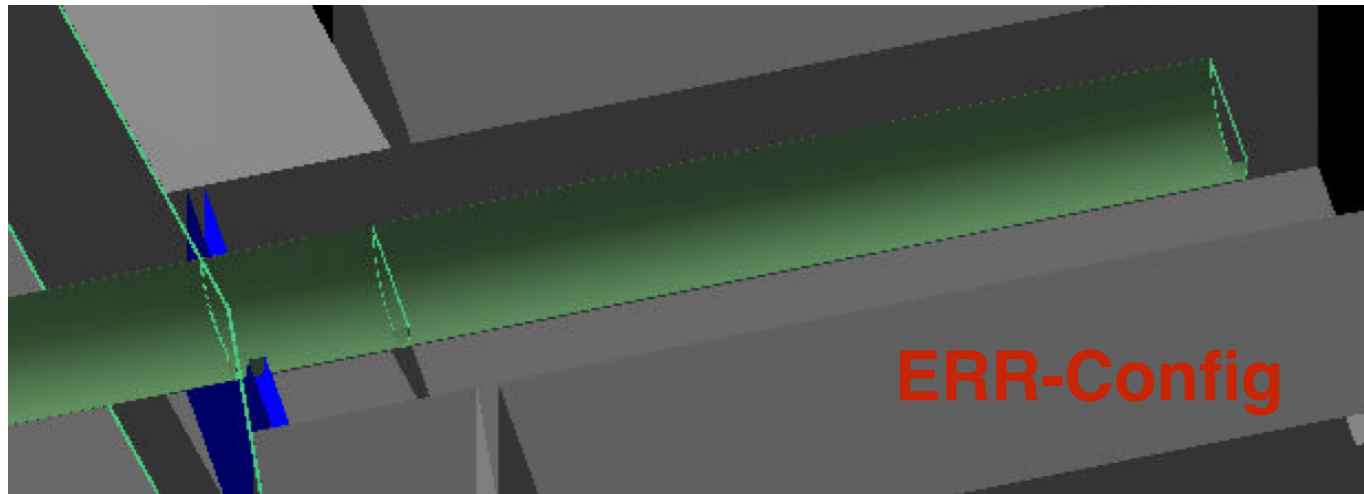
	ERR	Update
HRS rad [NEIL/cm2]	2.3E+11	2.1E+11

ERR estimates

1MeV n_{eq} / cm²

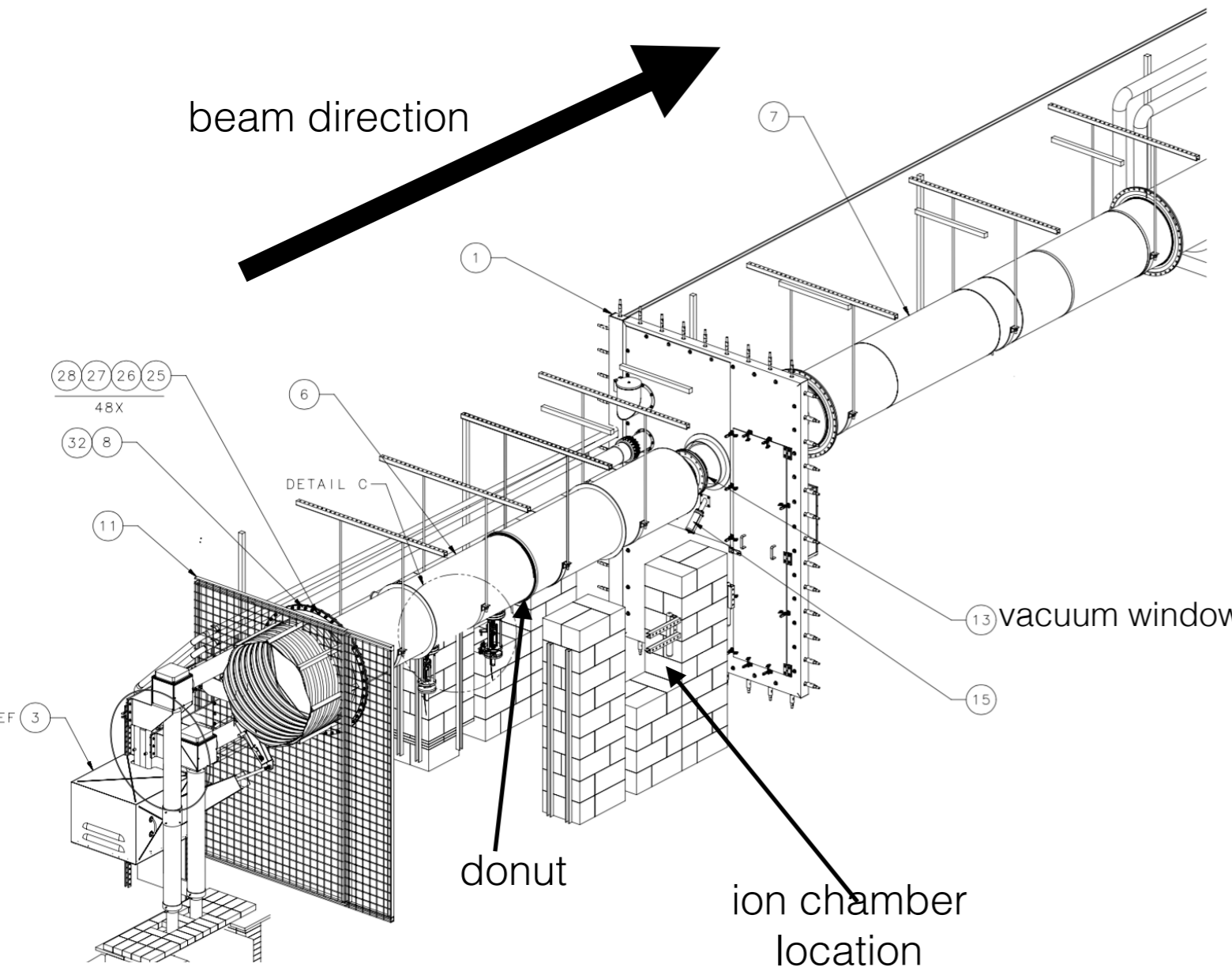
HRS power supply	PREX-I	PREX-II	CREX	P2/P1	CREX/P1	P2/H2	P2/PVDIS
neutron	1.0E+11	7.6E+09	1.5E+10	7%	20%	70%	73%
electron	1.2E+11	1.4E+10	2.1E+10	11%	12%	94%	84%
total	2.3E+11	2.1E+10	3.6E+10	9%	16%	83%	80%

NIEL thresholds: Semiconductor damage $\sim 10^{13}$, Optocoupler damage $\sim 10^{11}$

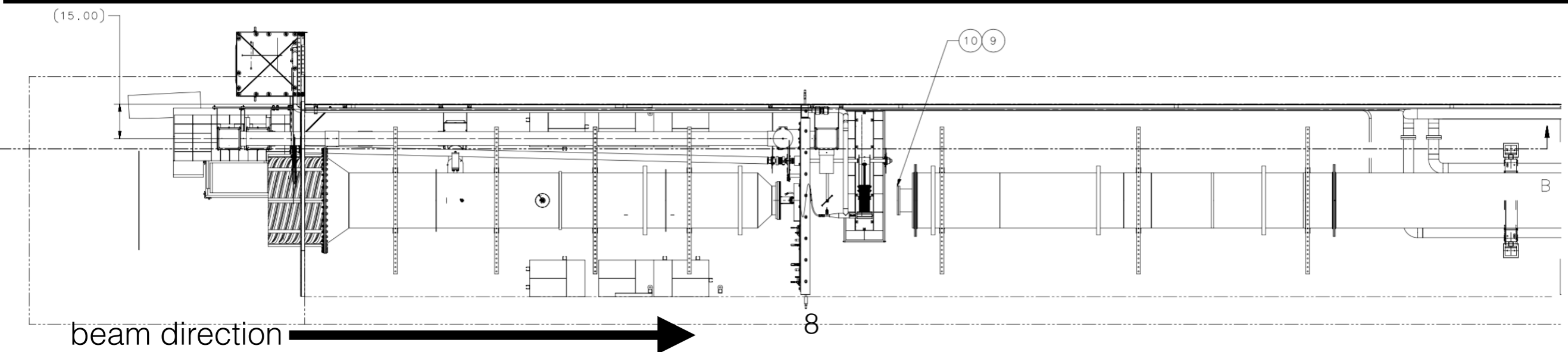
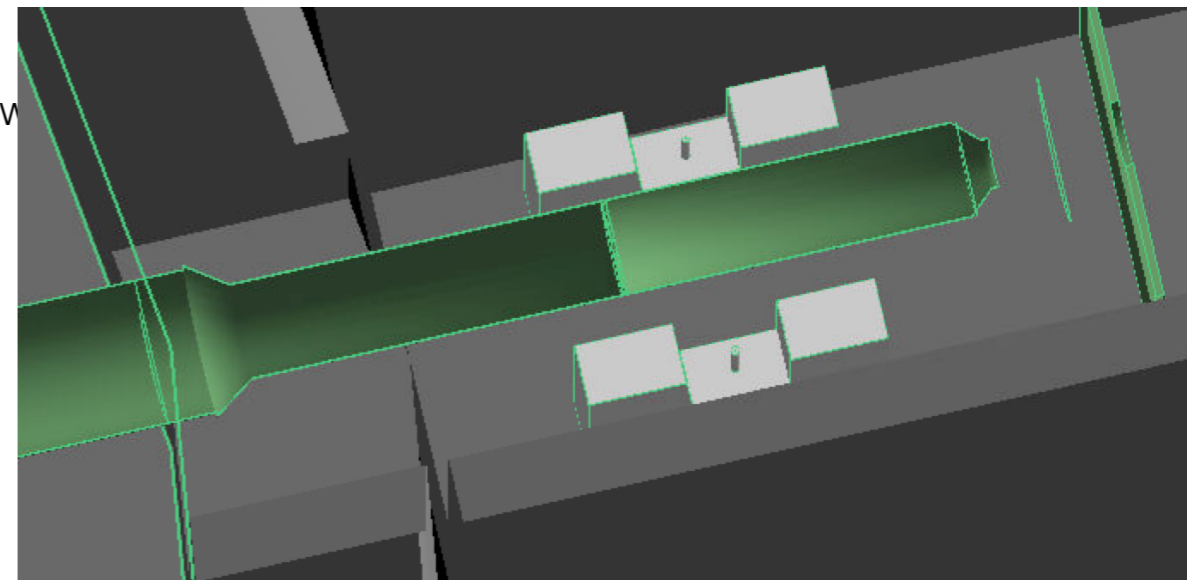


- Focus for design of PREX2 and CREX was successfully cleaning up the radiation from the target and collimator
- We used the same dump configuration for our simulations of PREX2 and CREX
 - We were unaware of changes made to the dump, so we expected our estimate to be reasonable

Current Hall A Dump configuration



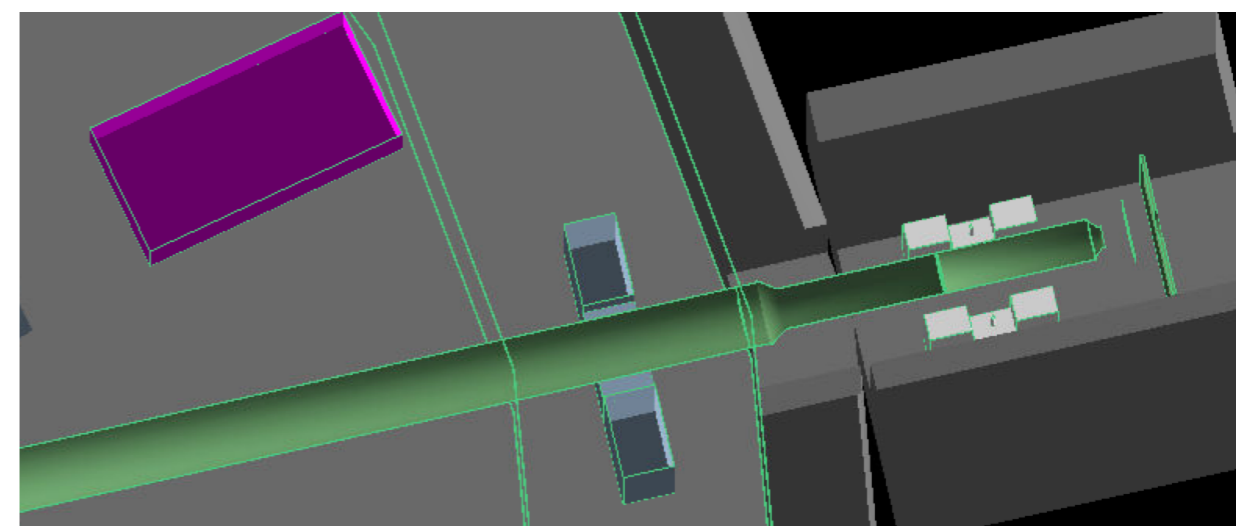
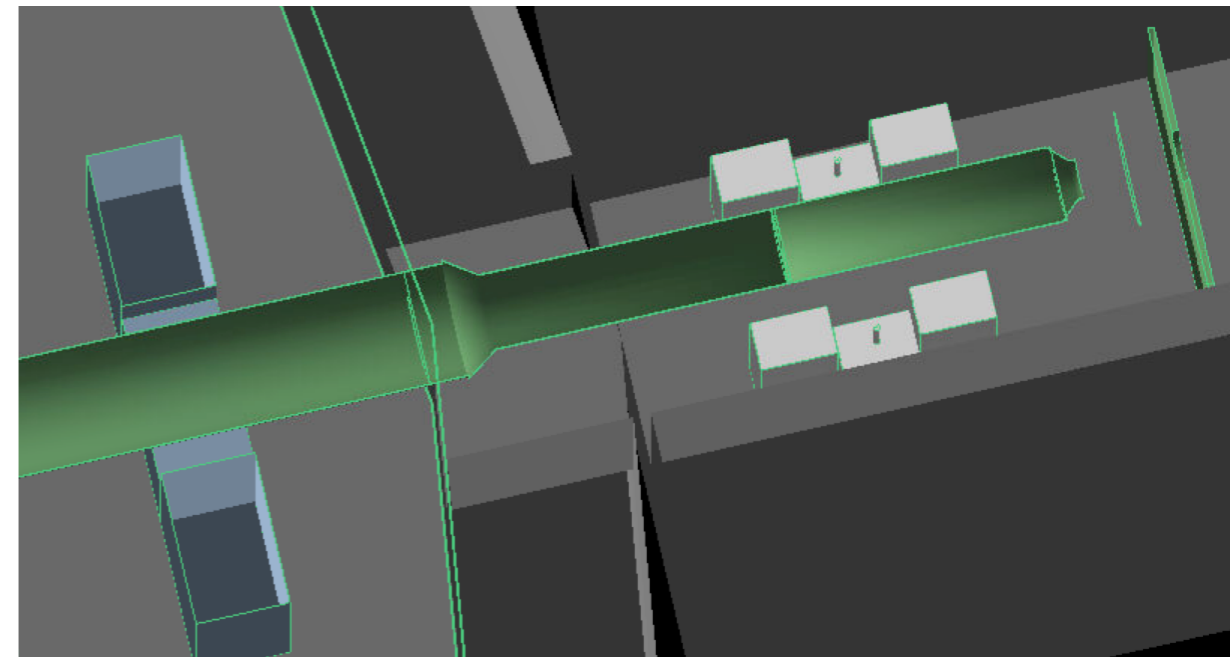
- For PREX2/CREX we will not need to use the diffuser
- We implemented the major features of the current design in the simulation
 - including the 4 cm Al aperture at ~midway until the Al door



Updated PREX2 and CREX estimates

	P2/P1 (ERR)	C/P1 (ERR)	P2/P1 (now)	C/P1 (now)	C(4in)/ P1	P2(2ft)/ P1
ratio to PREX 1	0.09	0.16	1.25	0.84	0.20	0.33

- The current dump configuration presents 2 problems:
 - the neck down intercepts scattered electrons (this is a problem for PREX2)
 - the aperture intercepts significantly more electrons than in the previous configuration (part of the problem for PREX2, the big issue for CREX)
- Increasing the aperture by ~6 cm (to the old 4in level) the CREX problem is basically solved
- Adding 2 feet of concrete to block the entire line of sight to the HRS detector reduces the PREX2 dose significantly
 - This base shielding design would be possible within the geometrical constraints inside the hall @12.5 deg



Conclusions and optimization plans

- The current dump configuration has the potential to produce significant radiation doses to the HRS electronics platform
- We have identified a 0th order mitigation scheme
 - optimization will follow (material, position, size)
- We plan to add the rest of the dump in the simulation to ensure nothing else could cause an issue

Radiation - entire run values

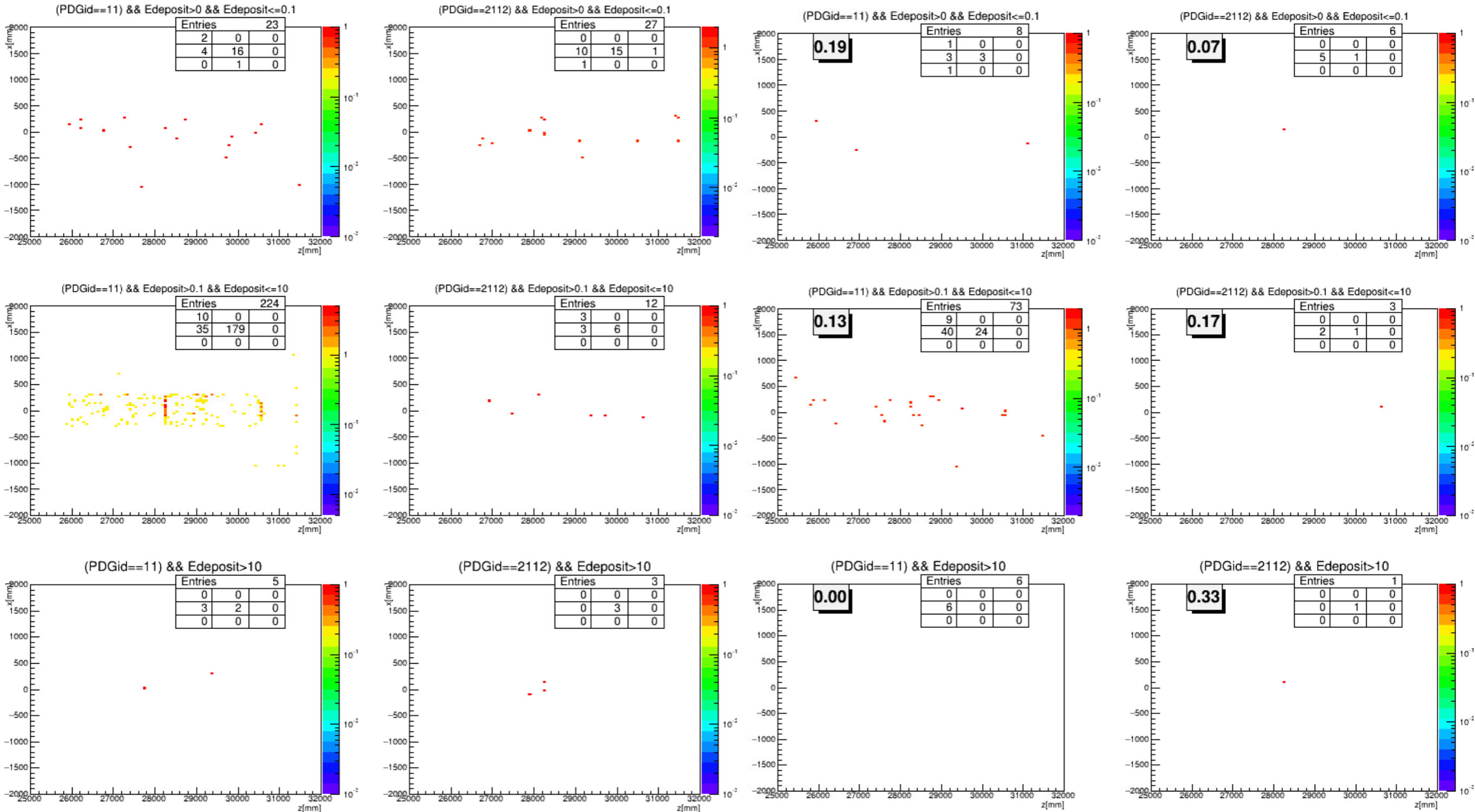
	HRS detector				Under detector			
	Total NEIL/cm2	uncert	Ratio to P1	uncert	Total NEIL/cm2	uncert	Ratio to P1	uncert
PREX1 (ERR dump)	4.60E+10	1.79E+09	1.00	0.06	7.43E+10	4.92E+09	1.00	0.09
PREX1 (actual dump)	4.05E+10	1.68E+09	0.88	0.05	7.78E+10	5.39E+09	1.05	0.10
PREX2 ERR	4.96E+09	6.72E+08	0.11	0.02	1.09E+10	2.61E+09	0.15	0.04
PREX2 current	5.77E+10	5.69E+09	1.25	0.13	7.60E+10	1.85E+10	1.02	0.26
P2 with P1pipe	2.12E+10	3.38E+09	0.46	0.08	4.39E+10	1.31E+10	0.59	0.18
P2 current+4in	4.46E+10	4.64E+09	0.97	0.11	6.68E+10	1.45E+10	0.90	0.20
P2 current+Conc	2.38E+10	3.44E+09	0.52	0.08	2.76E+10	1.04E+10	0.37	0.14
P2 current+ (Conc*2)	1.54E+10	1.81E+09	0.33	0.04	1.72E+10	4.07E+09	0.23	0.06
P2 current+ (Conc*0.5)	2.70E+10	2.63E+09	0.59	0.06	2.40E+10	6.13E+09	0.32	0.09
P2 current+Poly	2.19E+10	3.09E+09	0.48	0.07	5.40E+10	1.59E+10	0.73	0.22
P2 current+4in+1ftCont	1.83E+10	2.84E+09	0.40	0.06	2.69E+10	7.95E+09	0.36	0.11
P2 current + donut shield	5.27E+10	5.61E+09	1.15	0.13	8.28E+10	1.98E+10	1.11	0.28
CREX ERR	6.73E+09	2.05E+09	0.15	0.04	1.31E+10	6.57E+09	0.18	0.09
C5 current	3.86E+10	7.80E+09	0.84	0.17	4.70E+10	1.96E+10	0.63	0.27
C5 current+4in	9.86E+09	2.61E+09	0.21	0.06	3.80E+10	2.11E+10	0.51	0.29
C5 P1pipe	7.31E+10	1.12E+10	1.59	0.25	1.06E+11	3.38E+10	1.43	0.47
C5 current+Conc	2.23E+10	5.78E+09	0.49	0.13	3.21E+10	1.65E+10	0.43	0.22
C5 current+(Conc*2)	1.73E+10	3.23E+09	0.38	0.07	2.68E+10	1.00E+10	0.36	0.14
C5 current+(Conc*0.5)	1.70E+10	3.35E+09	0.37	0.07	1.09E+10	5.20E+09	0.15	0.07
C5 current+Poly	1.86E+10	5.13E+09	0.40	0.11	1.40E+10	1.01E+10	0.19	0.14
C5 current+ 2Pipe septum	3.85E+10	8.70E+09	0.84	0.19	9.65E+10	3.52E+10	1.30	0.48
C5 current+ 4in+1ftConc	1.01E+10	3.28E+09	0.22	0.07	3.85E+10	2.35E+10	0.52	0.32
C5 current+2Pipe+donut shield	4.09E+10	7.86E+09	0.89	0.17	4.73E+10	2.41E+10	0.64	0.33

Area for HRS det: 4e5 cm²
Area for Under det: 6e4 cm²

PREX2 - Under HRS detector

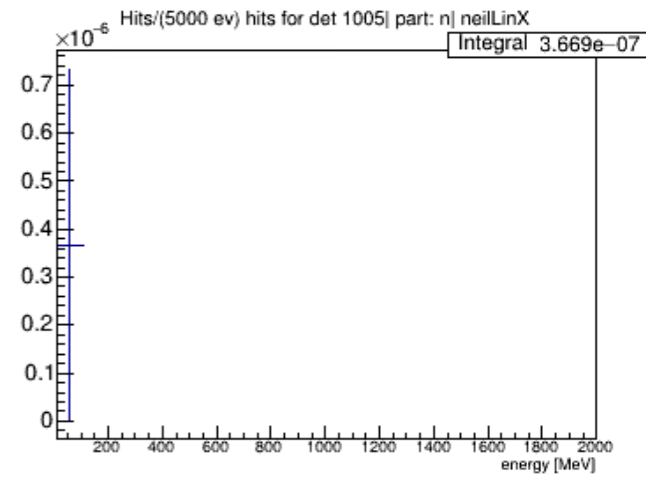
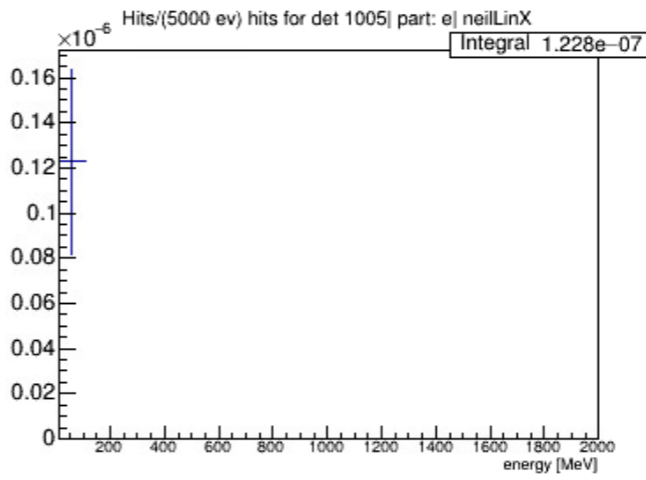
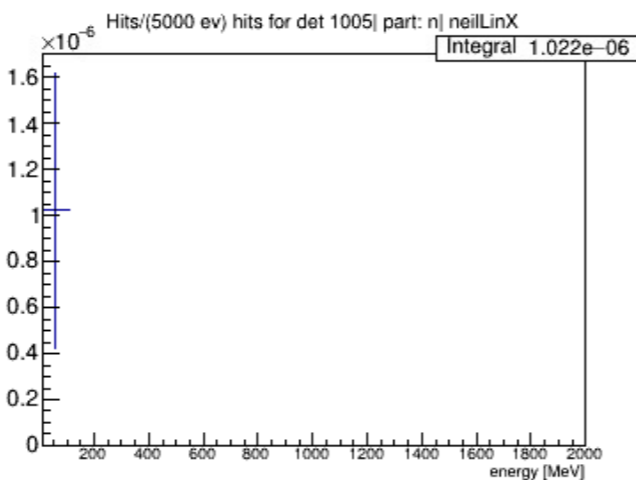
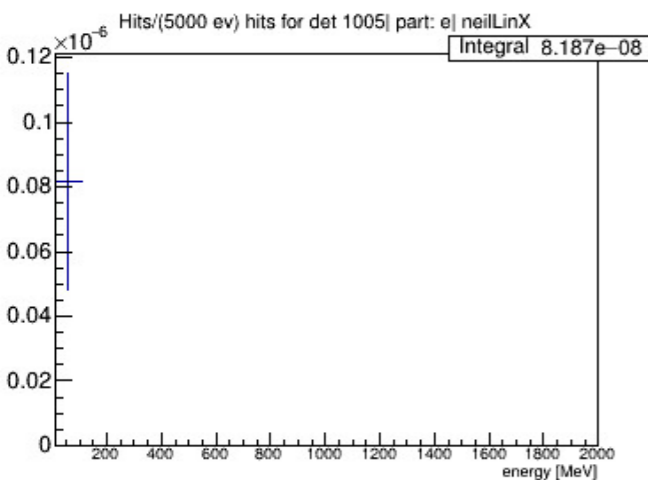
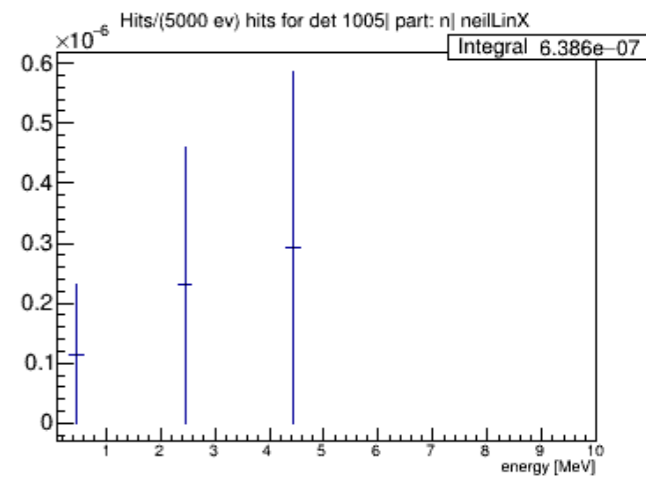
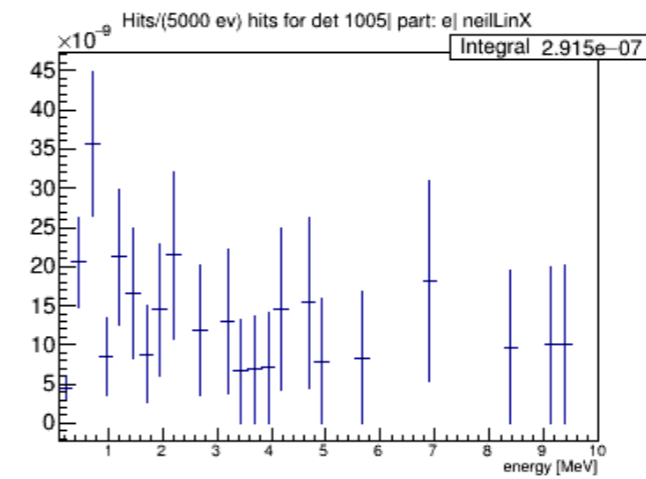
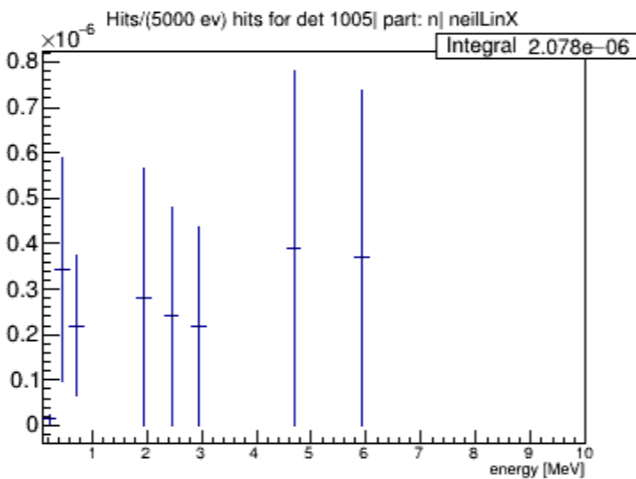
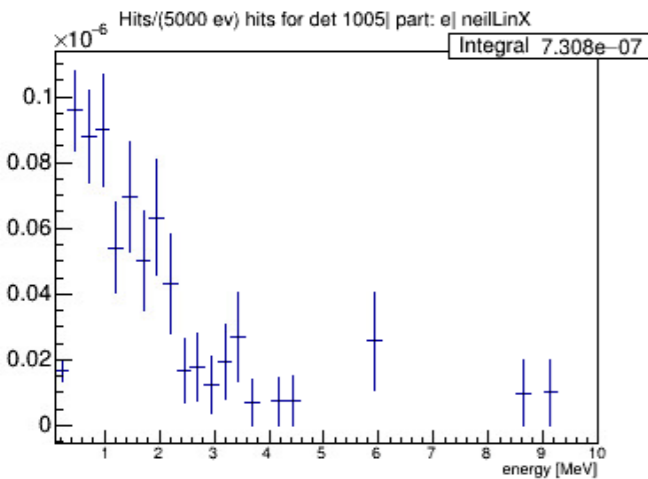
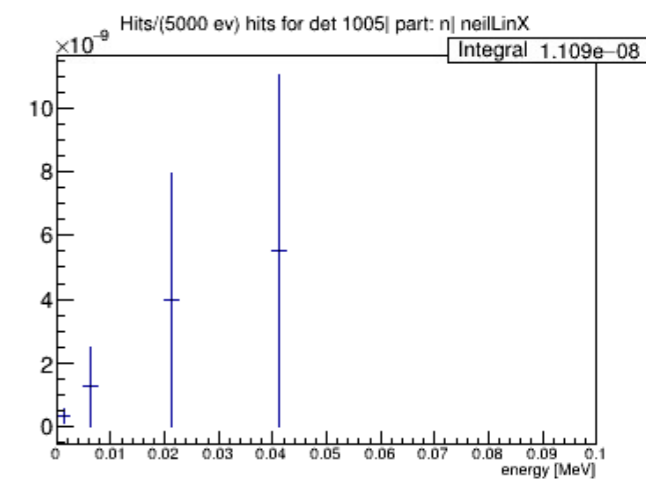
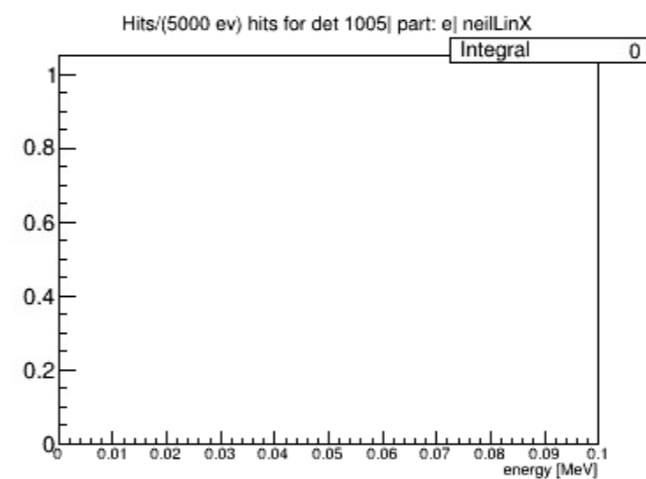
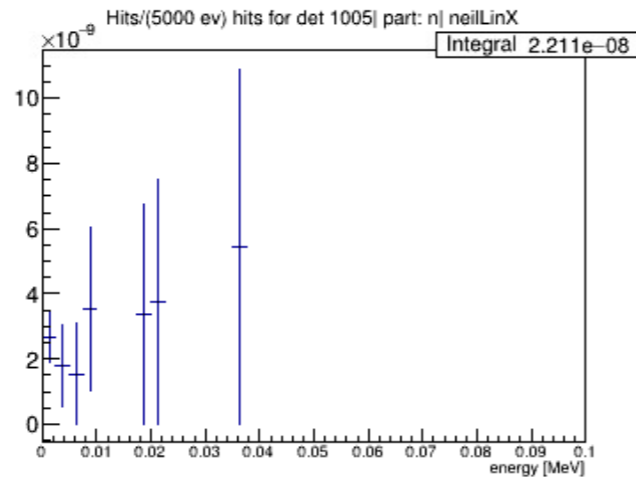
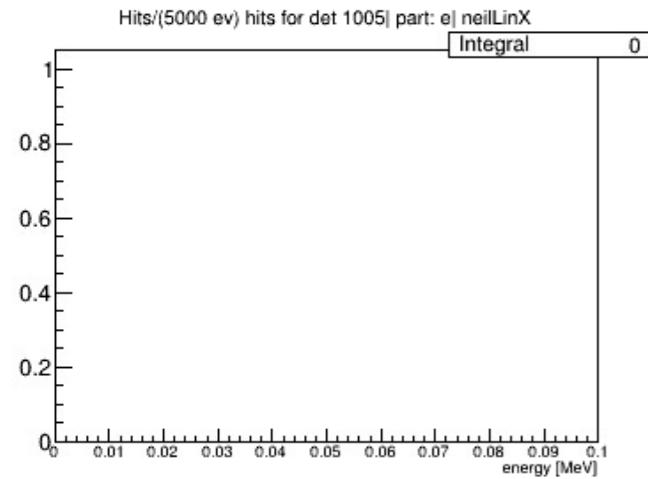
current setup

current setup + 1 ft Concrete



PREX2 - Under HRS detector

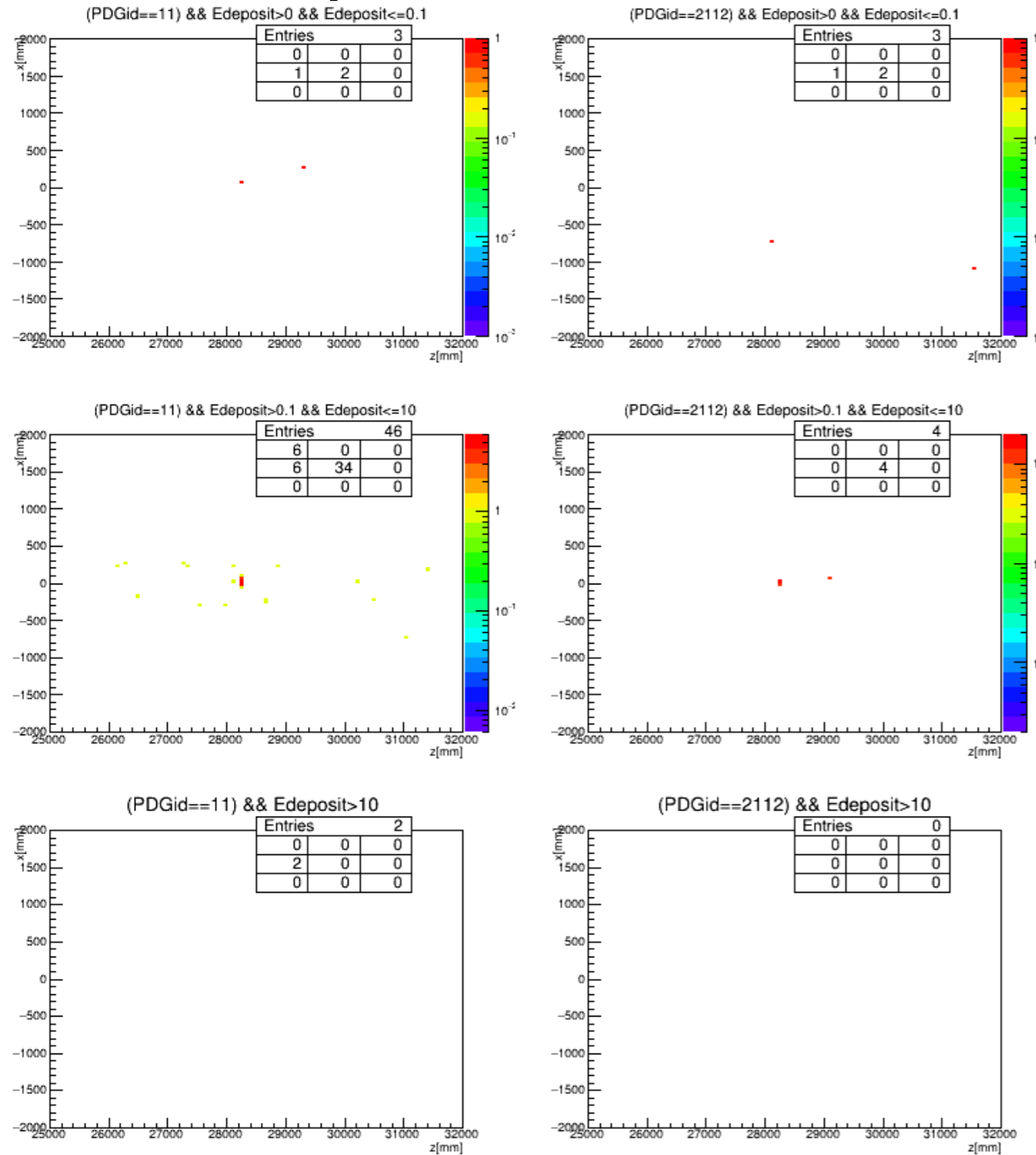
current setup



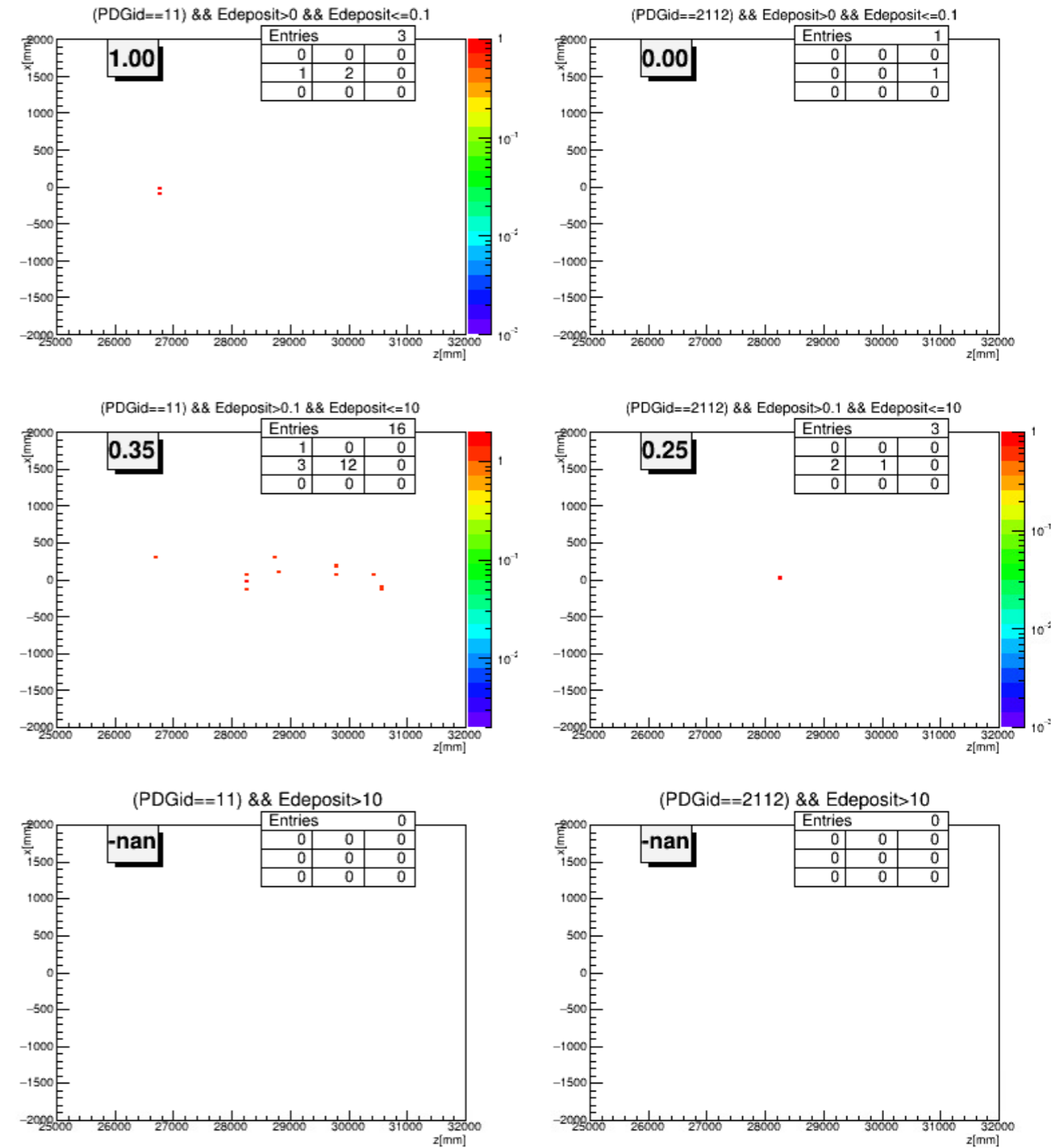
current setup + 1 ft Concrete

CREX - Under HRS detector

current setup

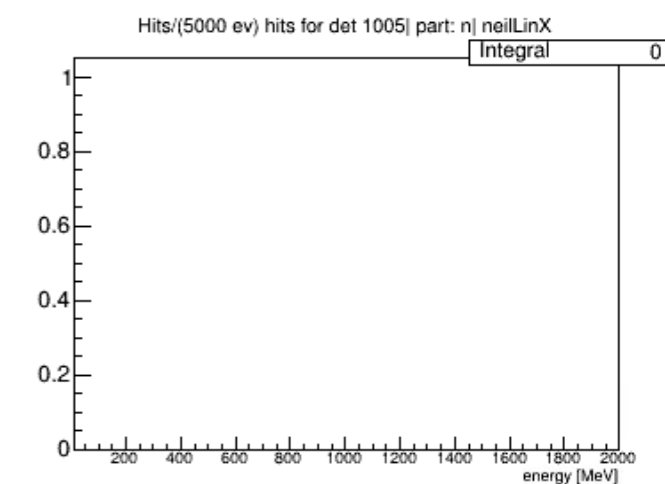
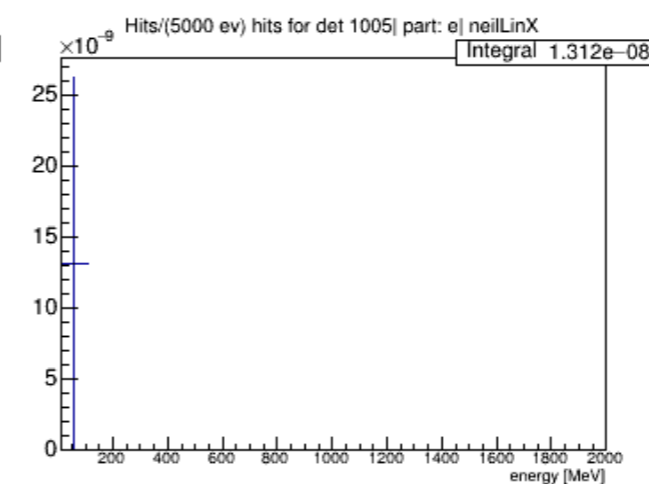
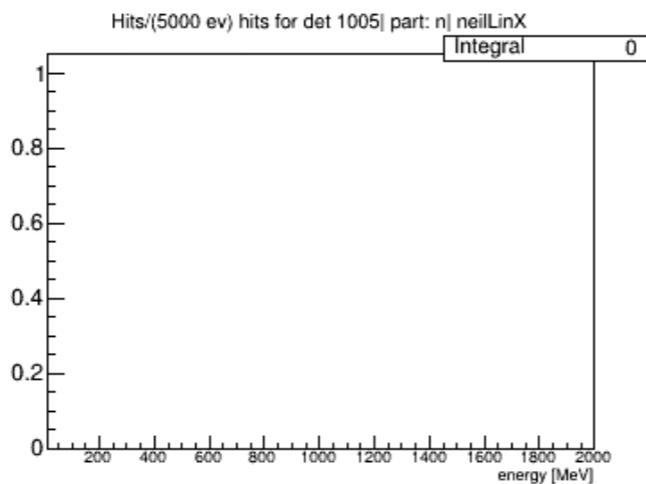
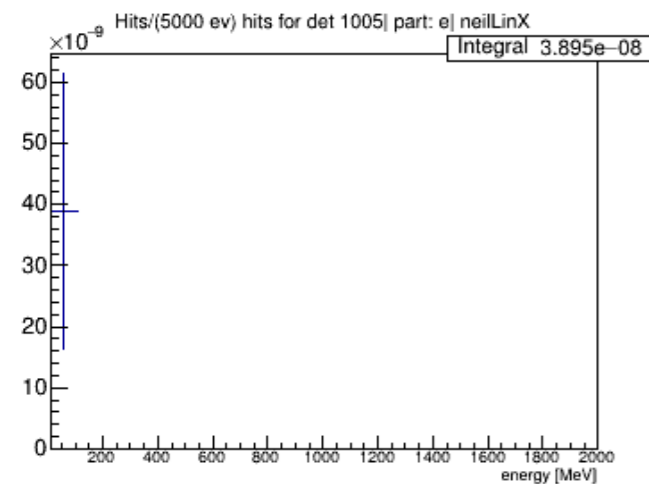
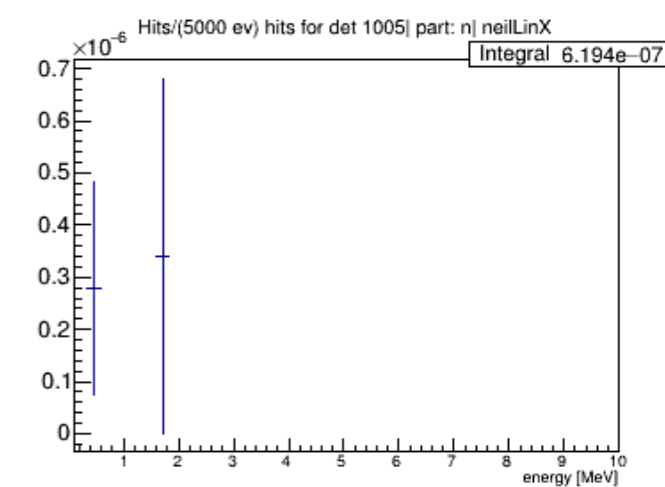
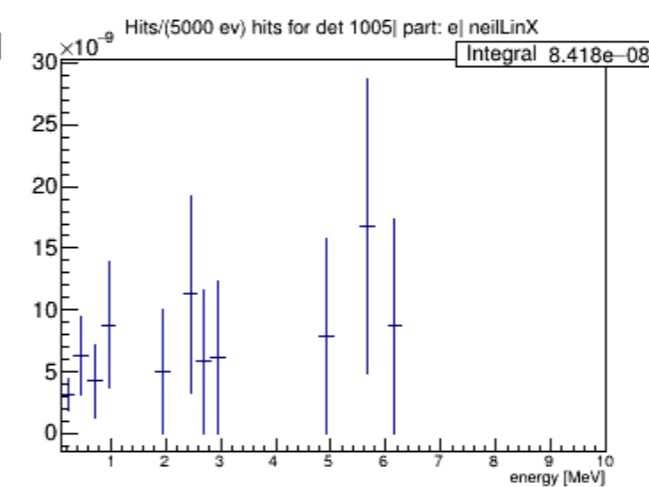
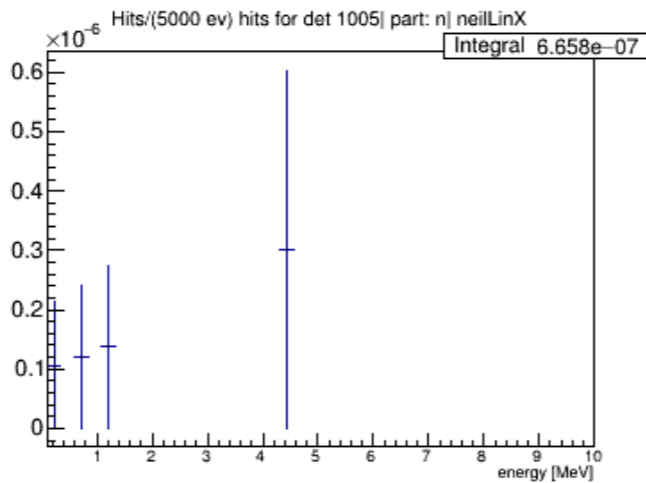
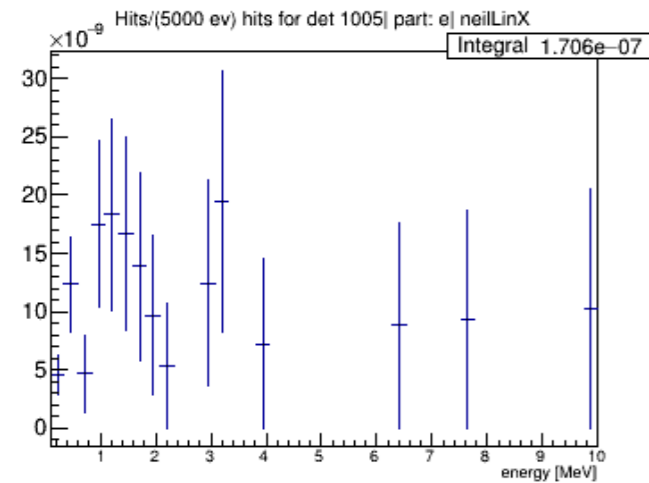
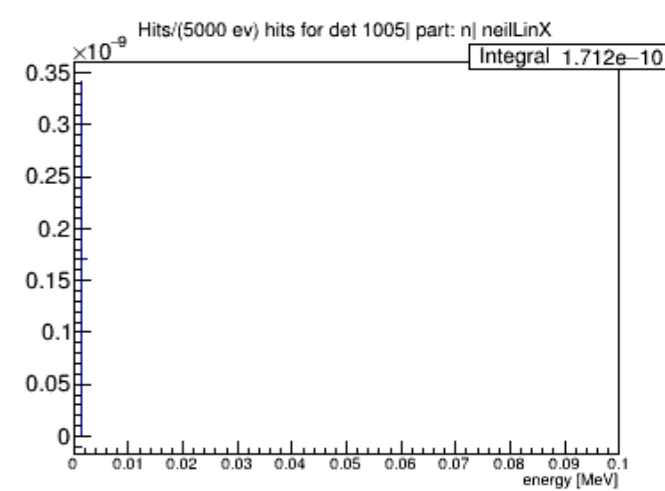
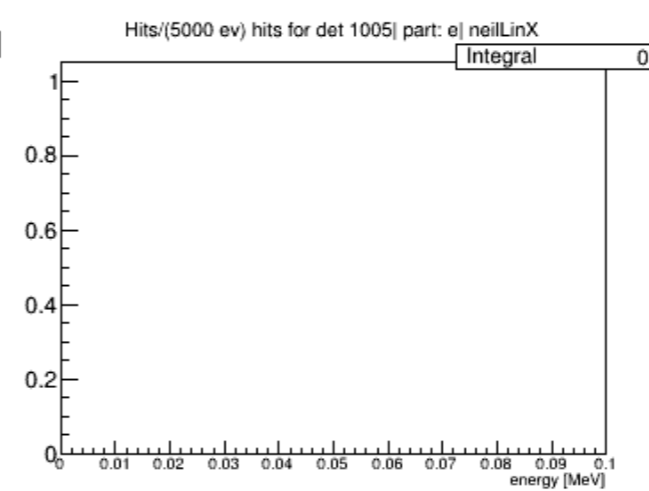
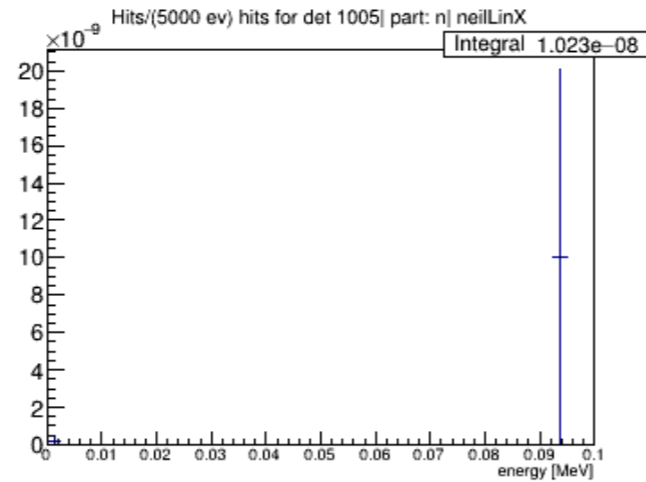
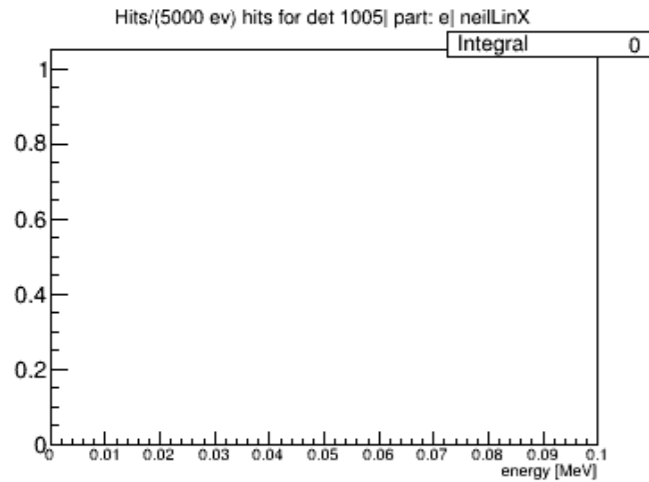


current setup + 1 ft Concrete



CREX - Under HRS detector

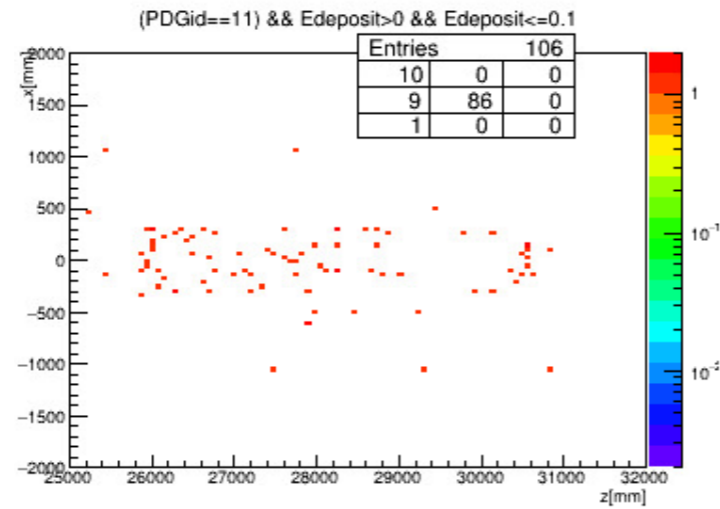
current setup



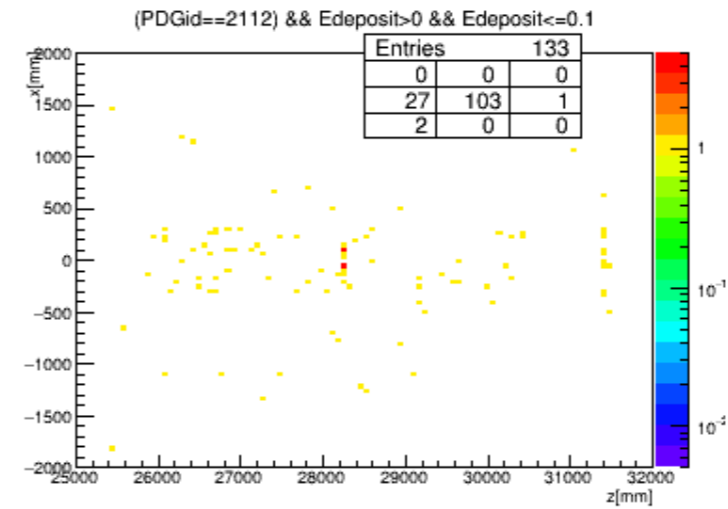
current setup + 4 in donut

PREX2 - current dump

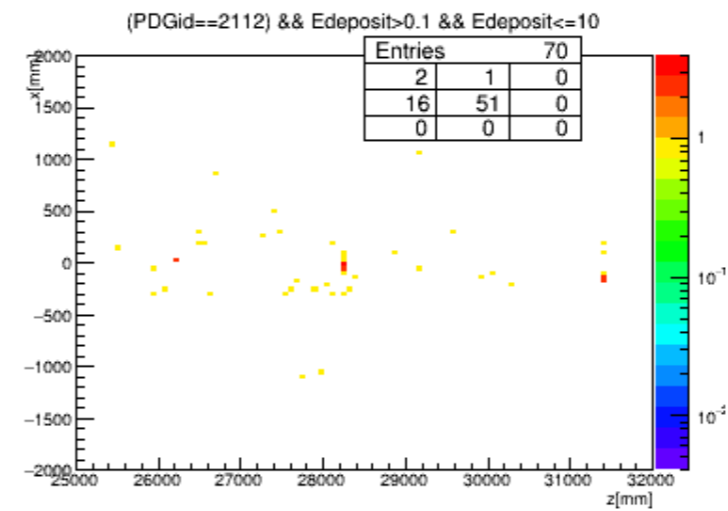
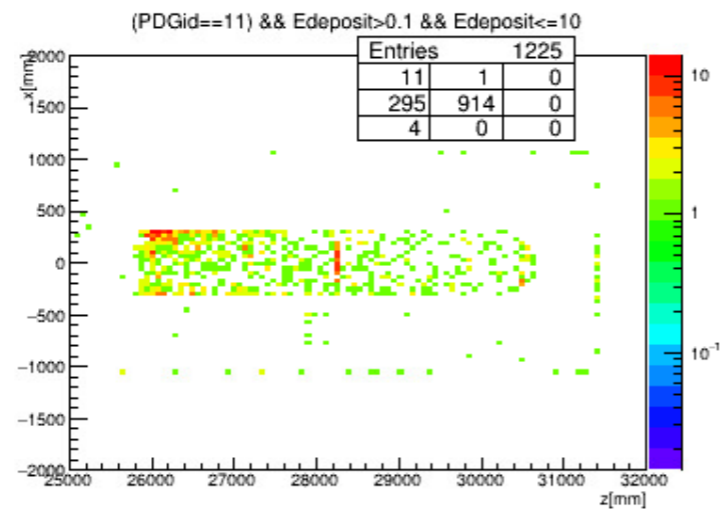
electrons



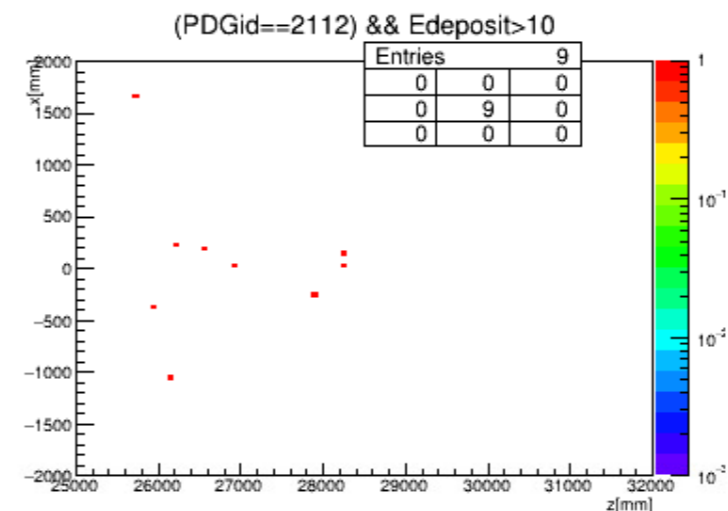
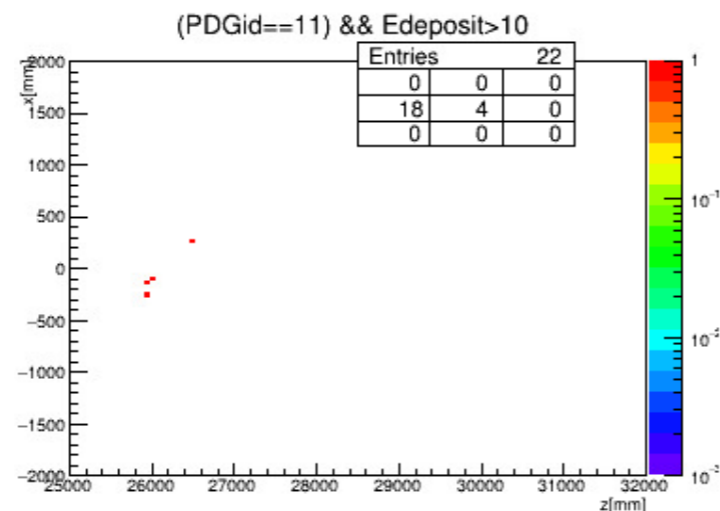
neutrons



$0 < E \leq 0.1$ MeV



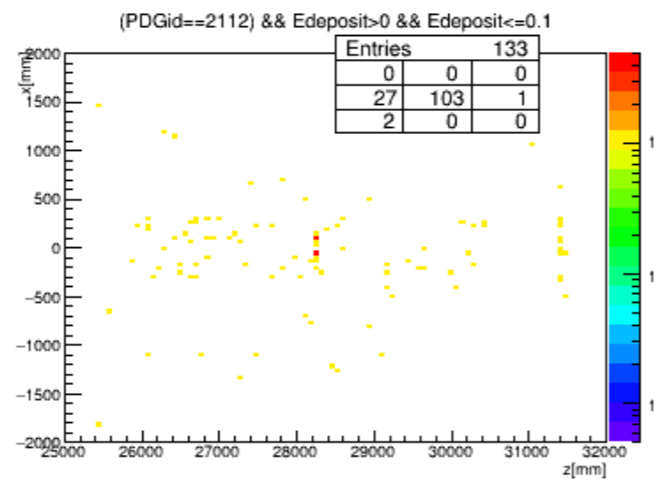
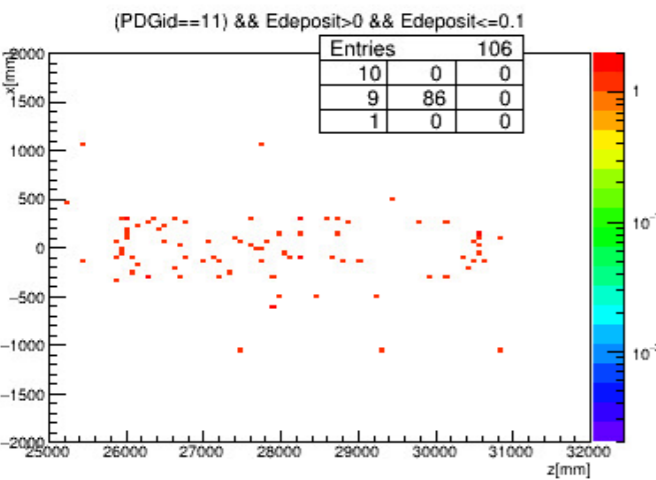
$0.1 < E \leq 10$ MeV



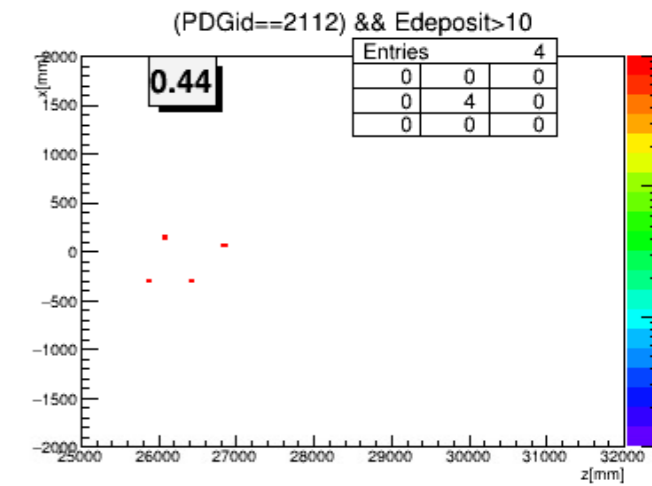
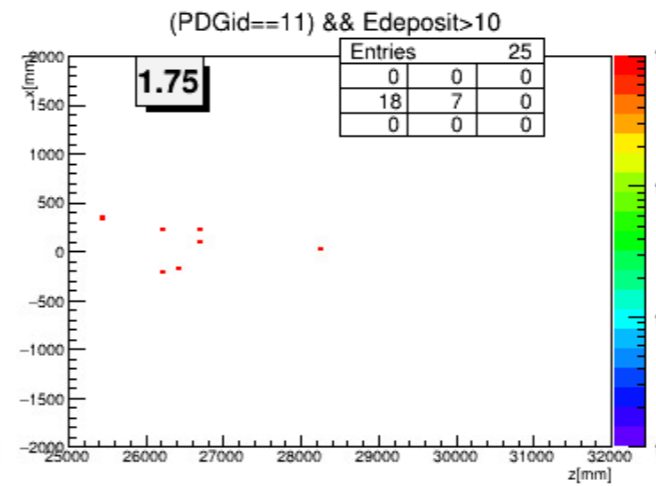
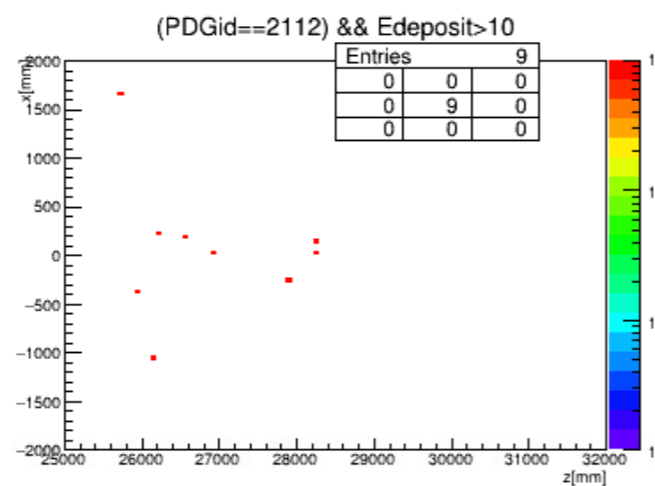
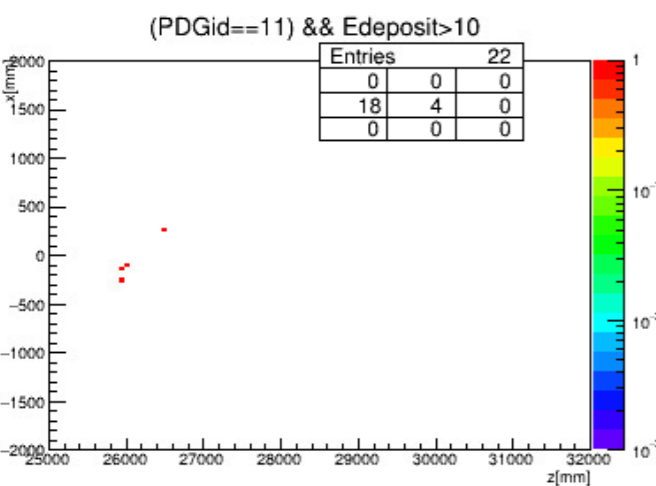
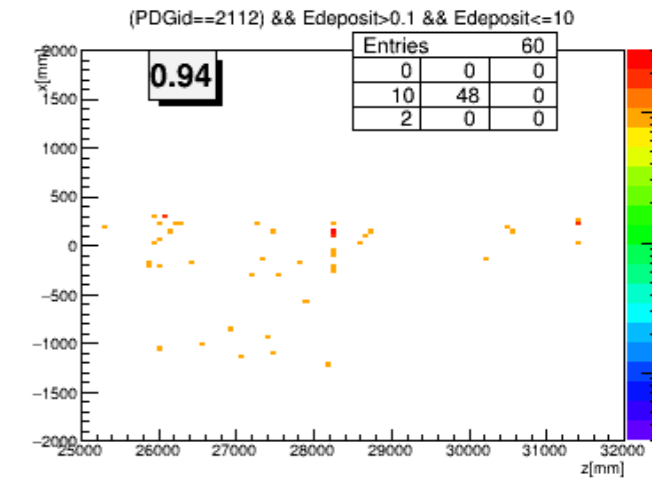
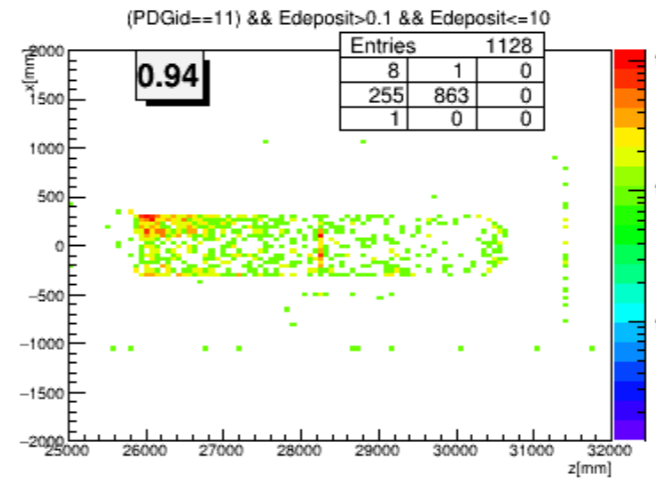
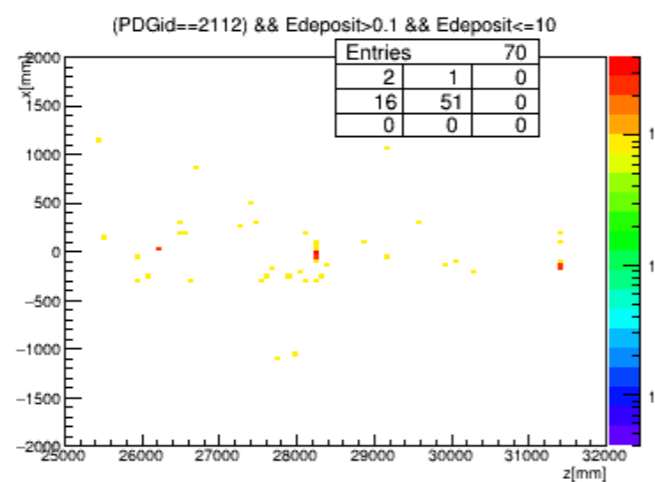
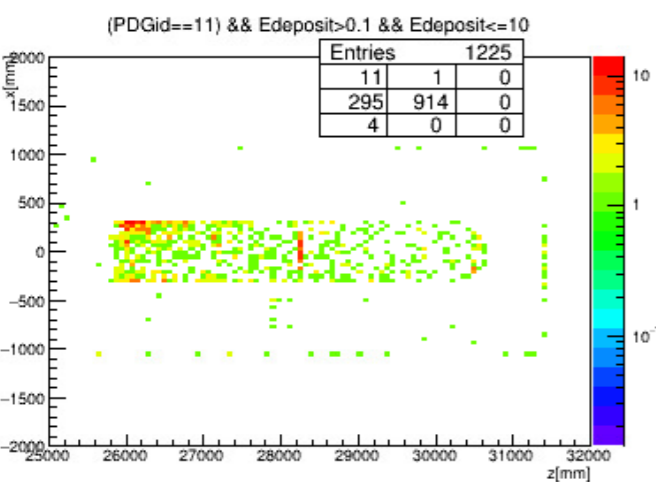
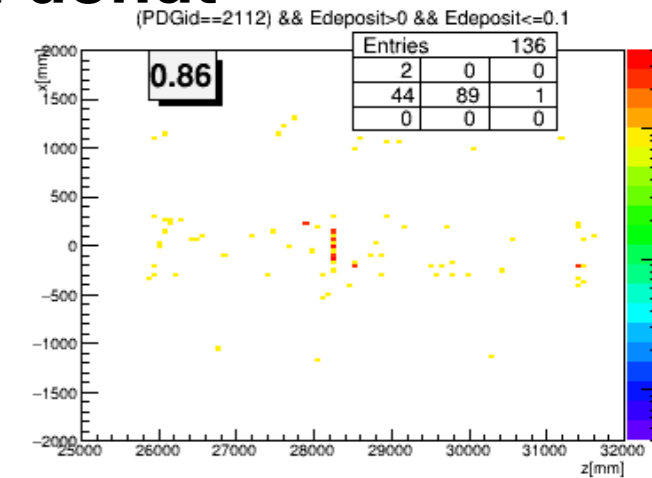
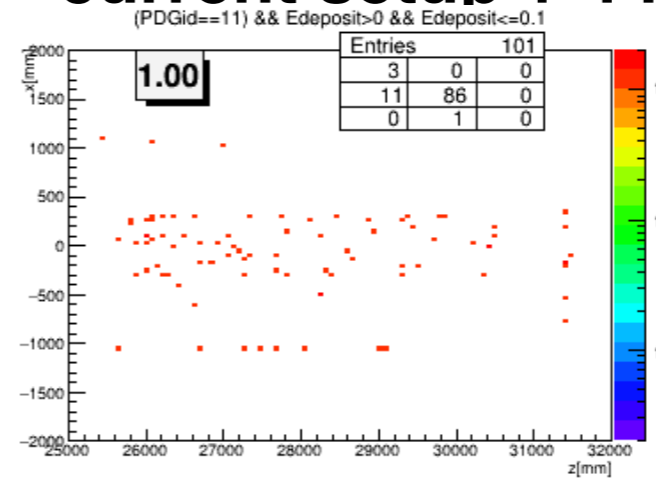
$10 < E$ MeV

PREX2 - comparison

current setup

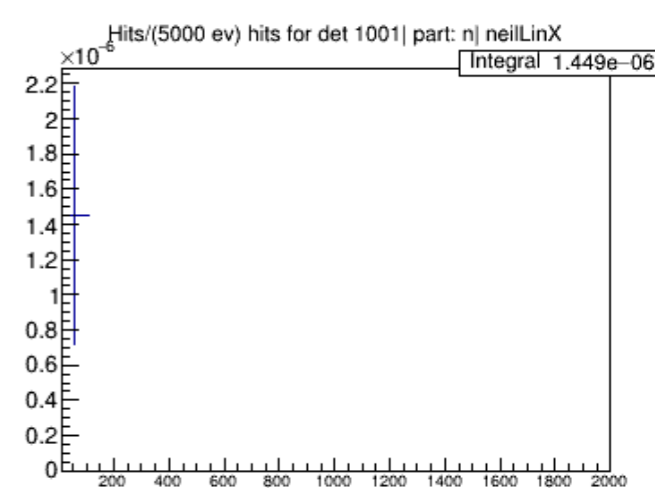
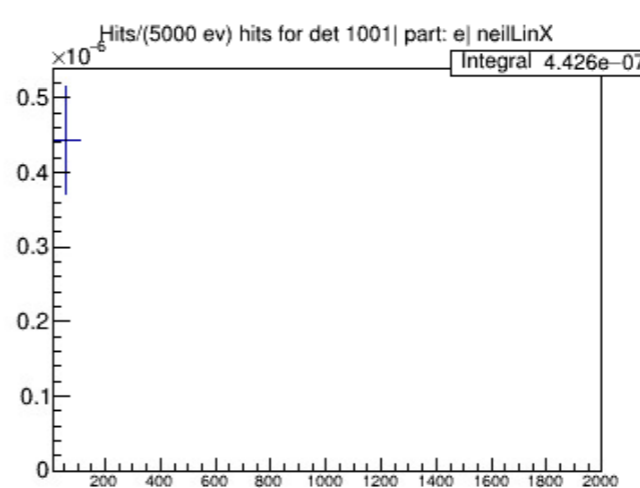
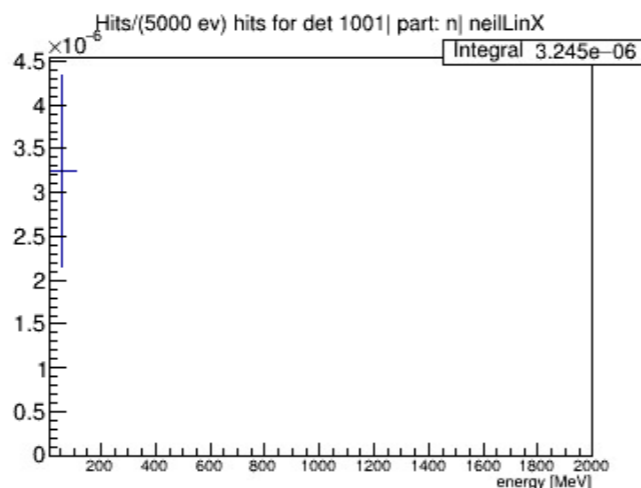
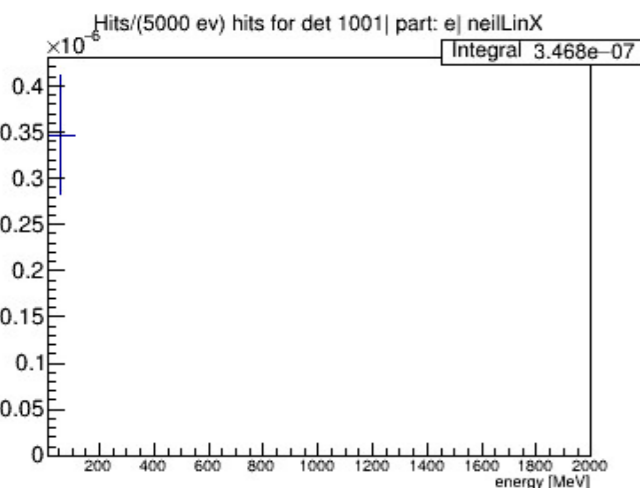
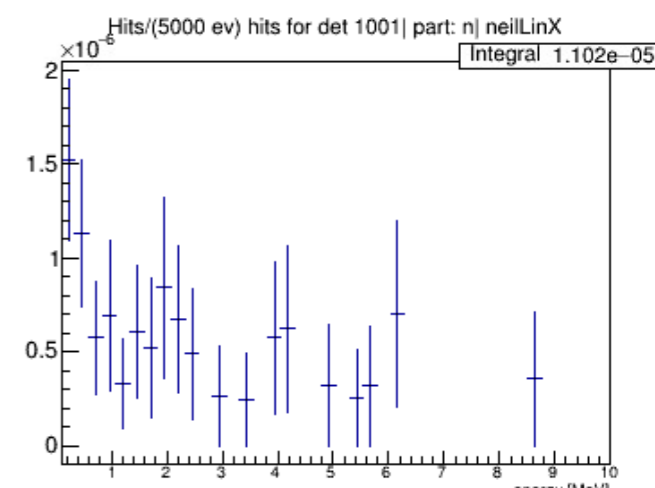
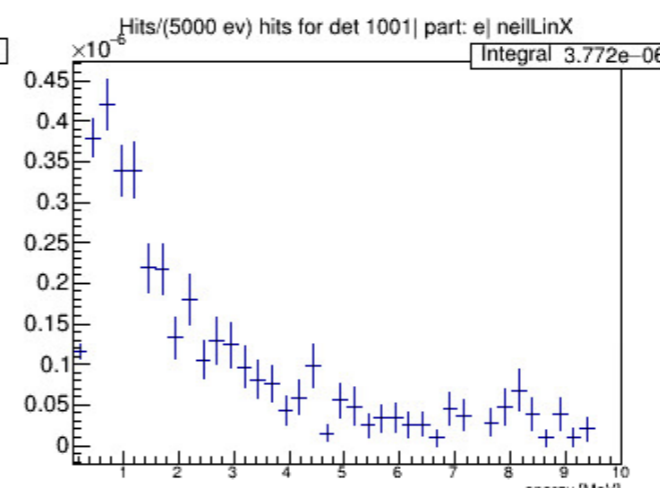
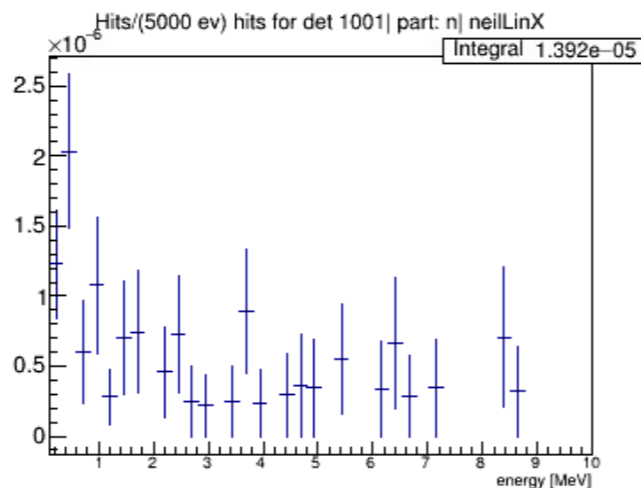
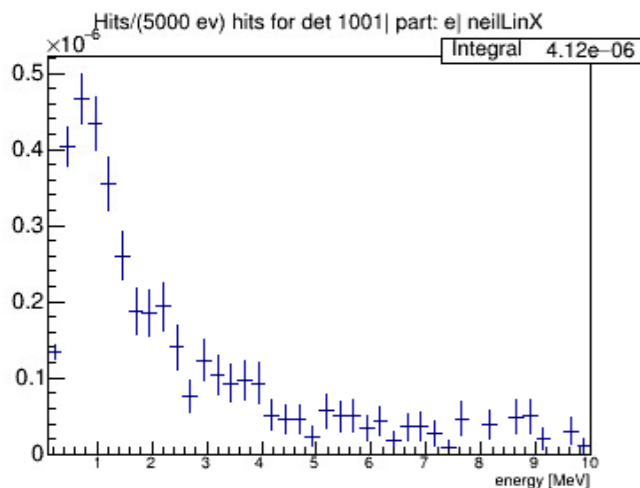
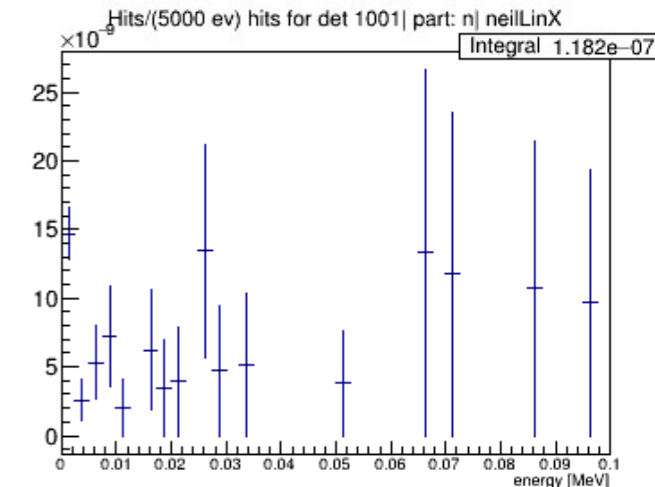
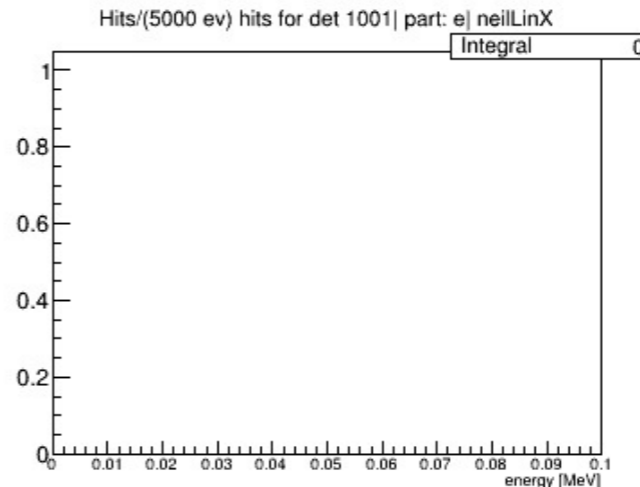
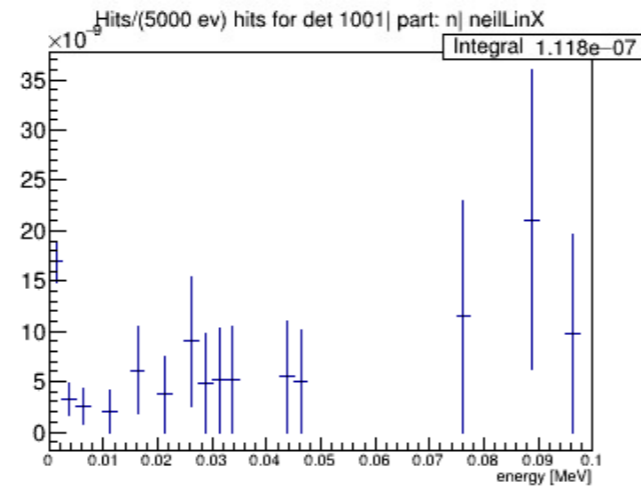
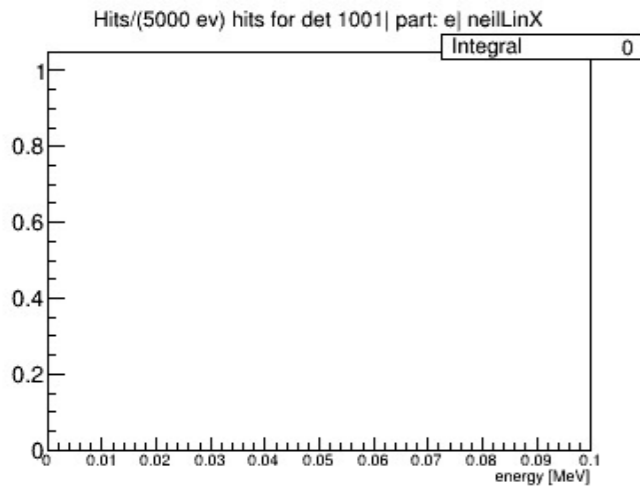


current setup + 4 in donut



PREX2 - comparison

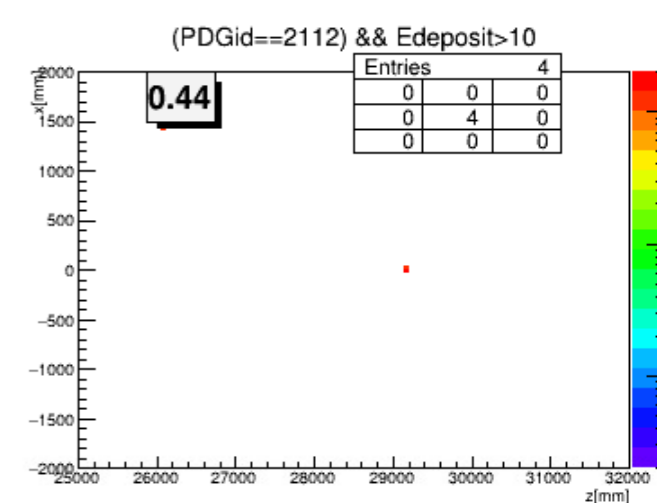
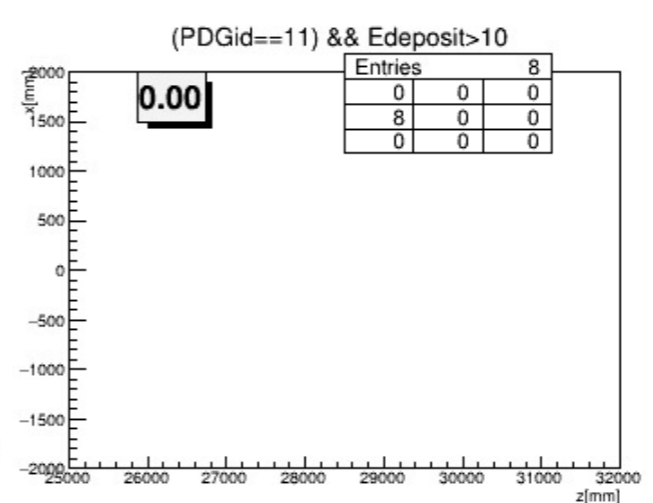
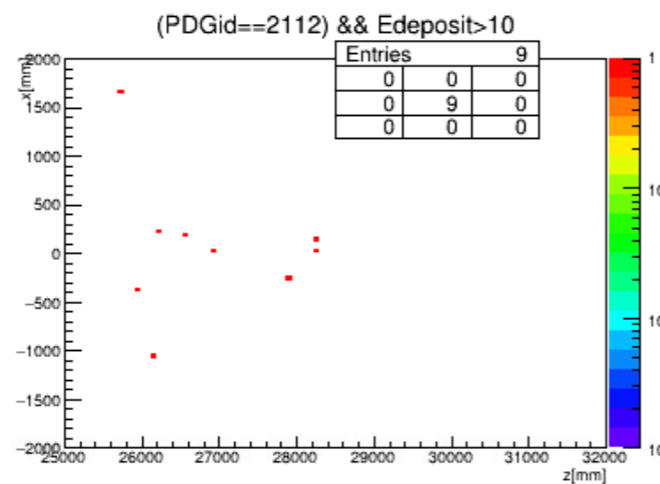
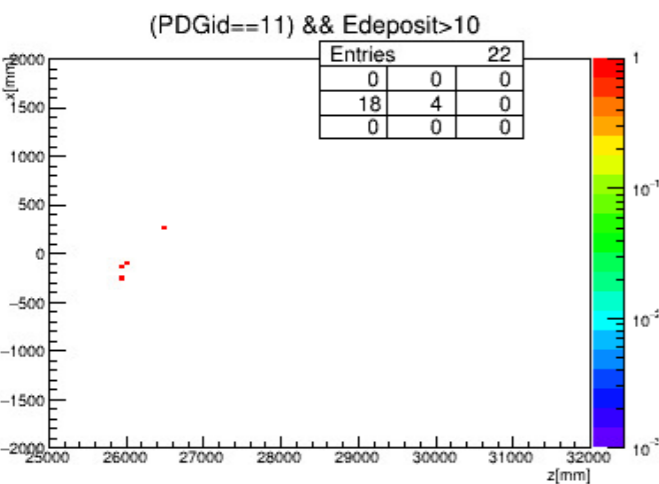
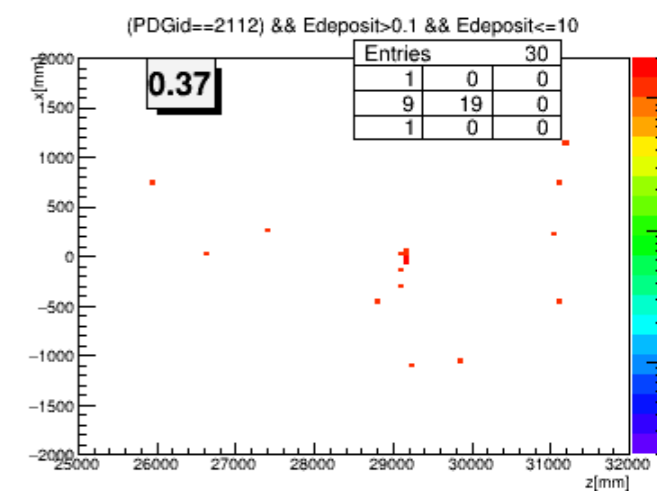
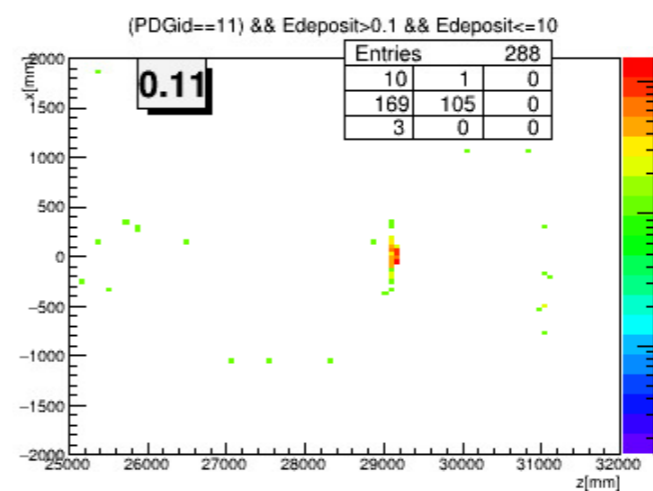
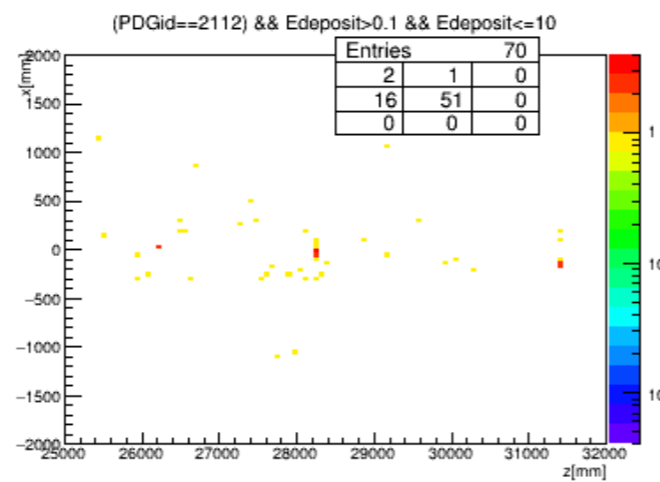
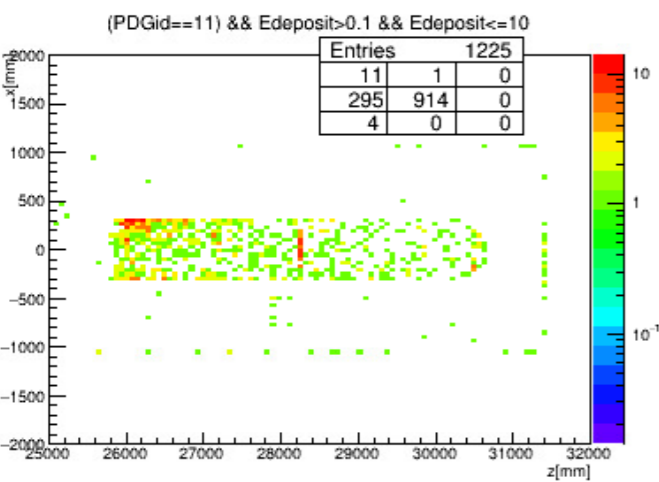
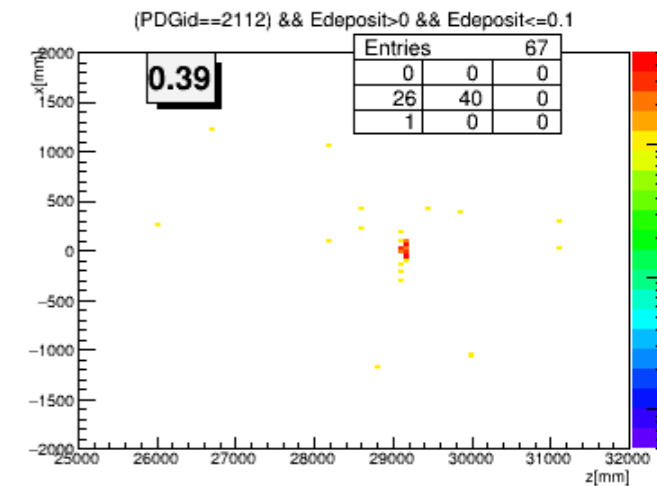
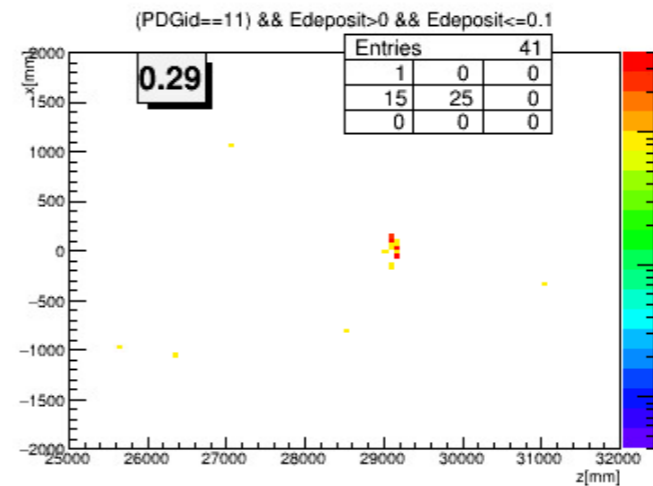
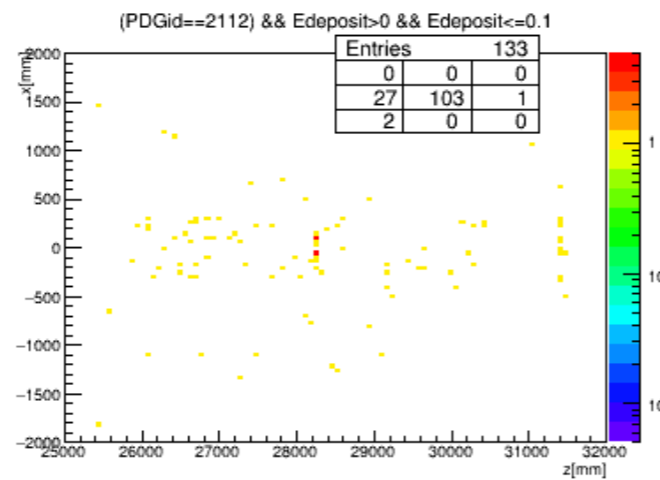
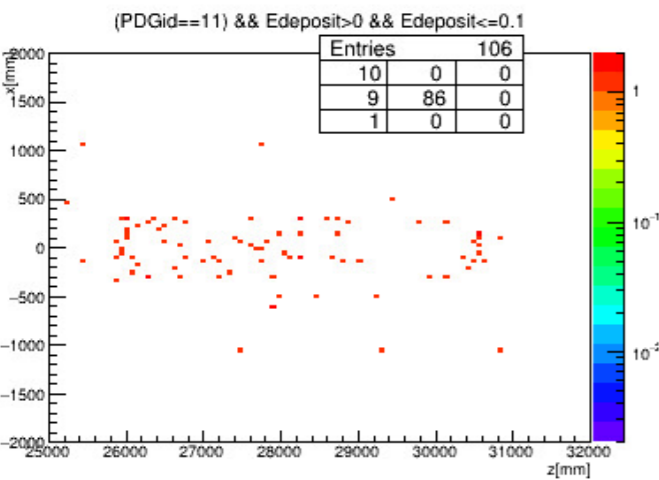
current setup



current setup + 4 in Donut

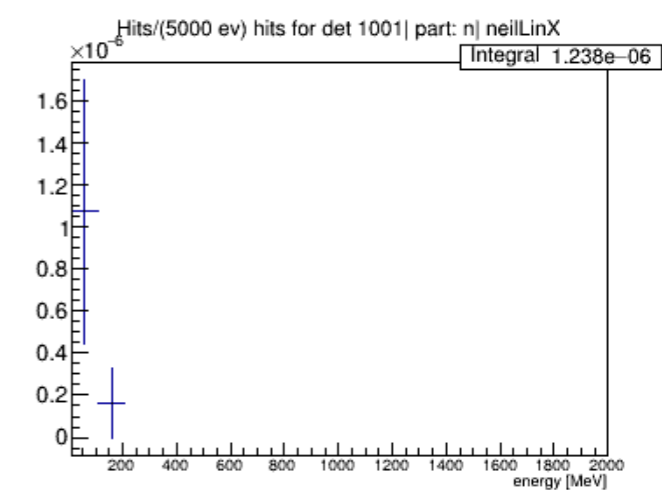
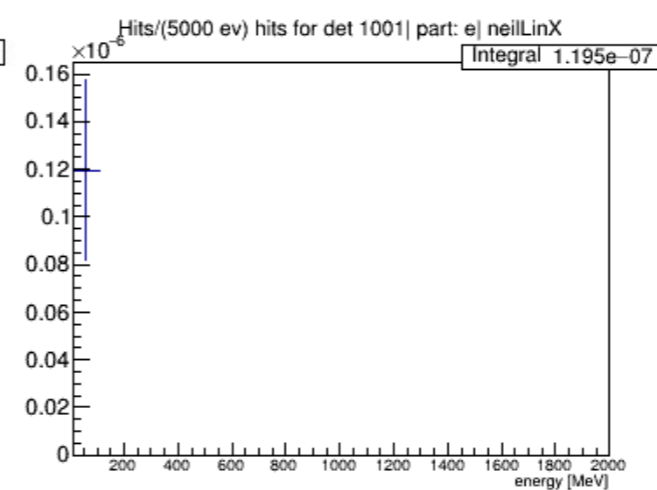
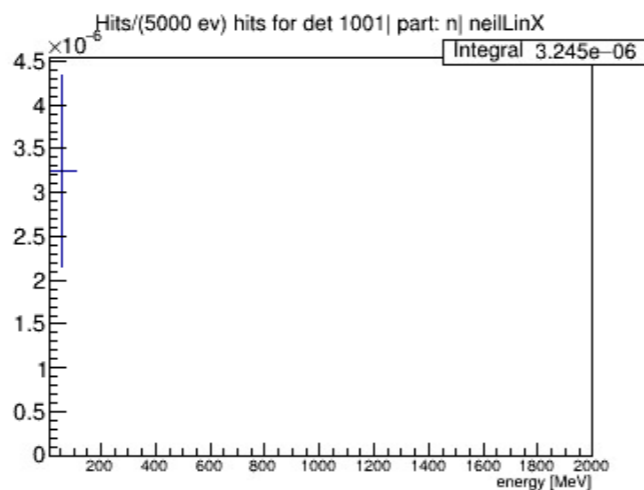
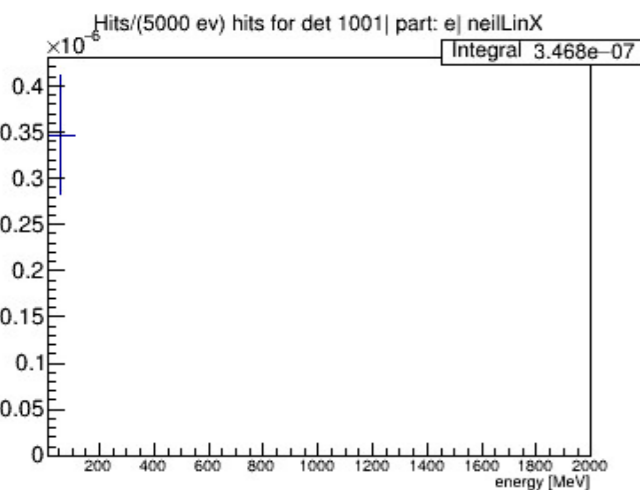
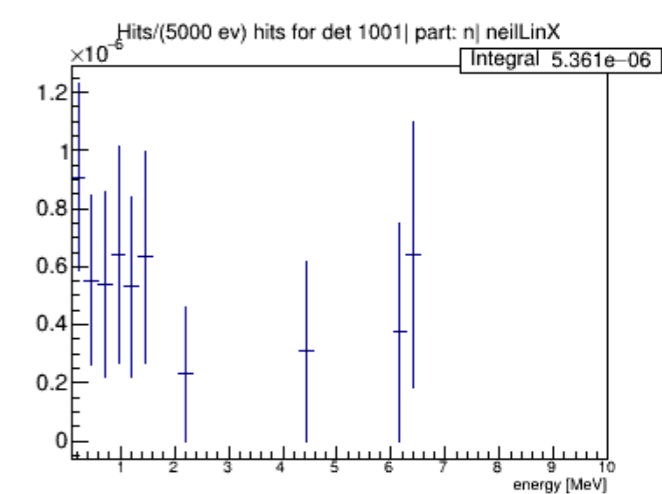
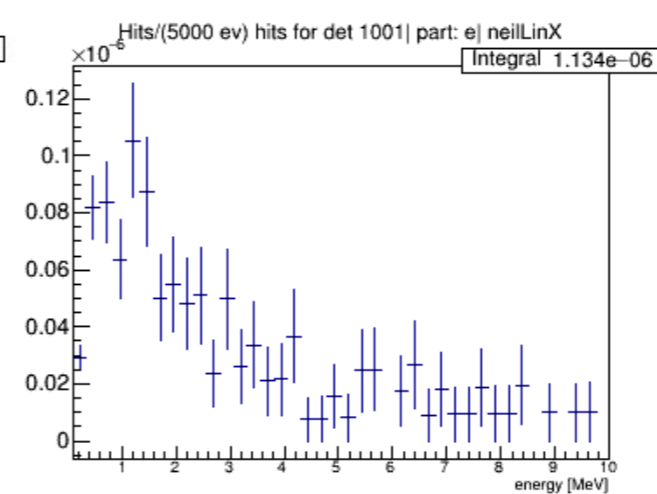
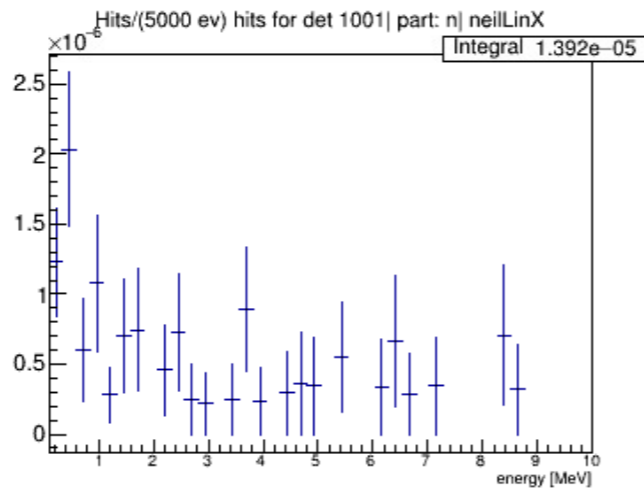
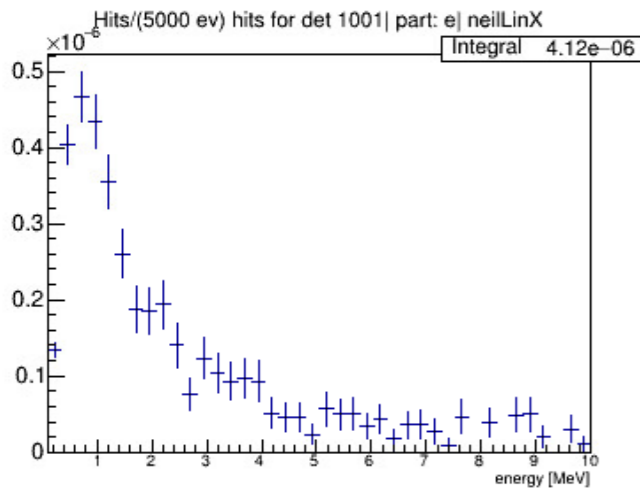
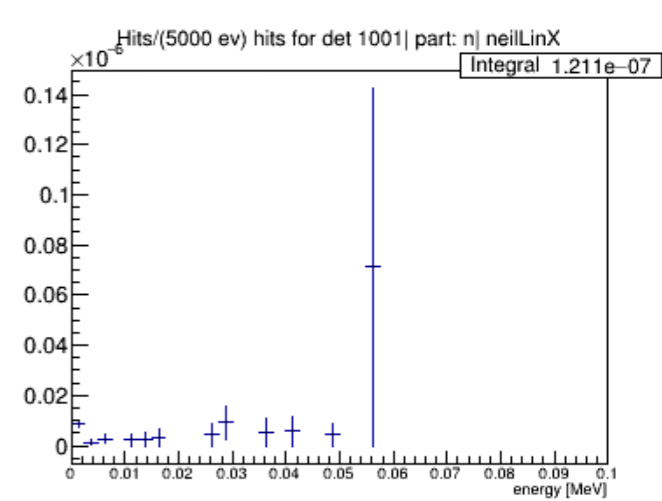
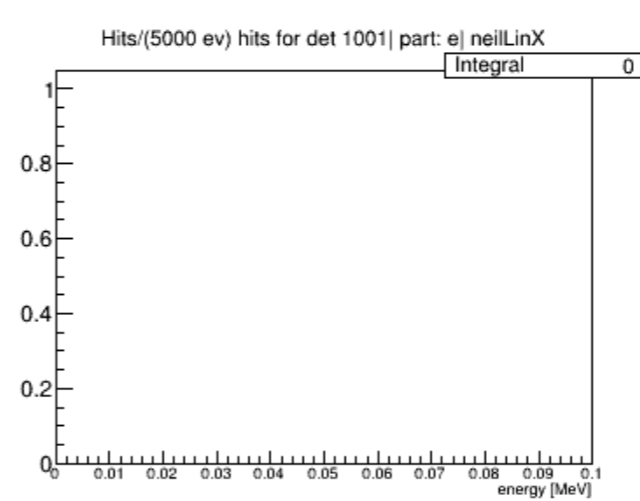
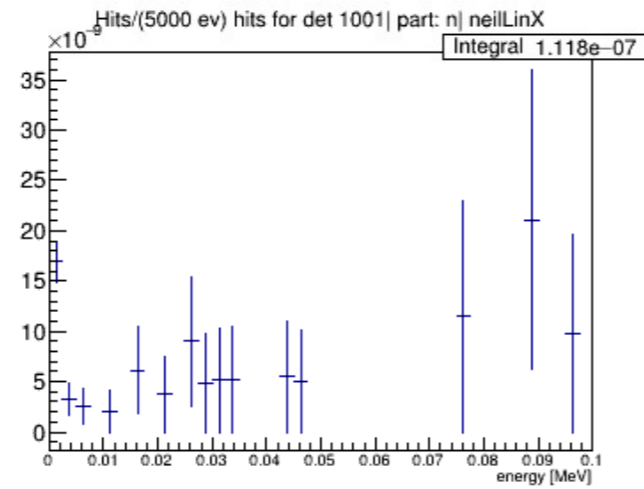
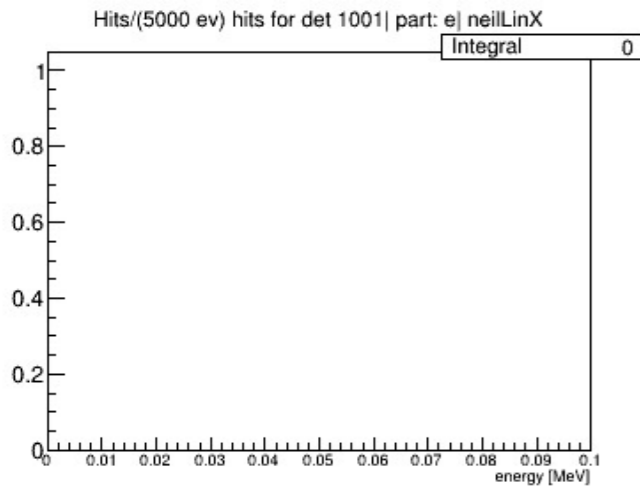
PREX2 - comparison

current setup



PREX2 - comparison

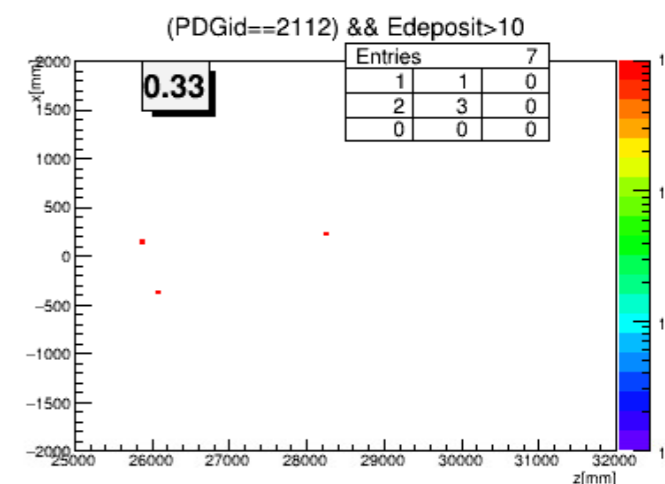
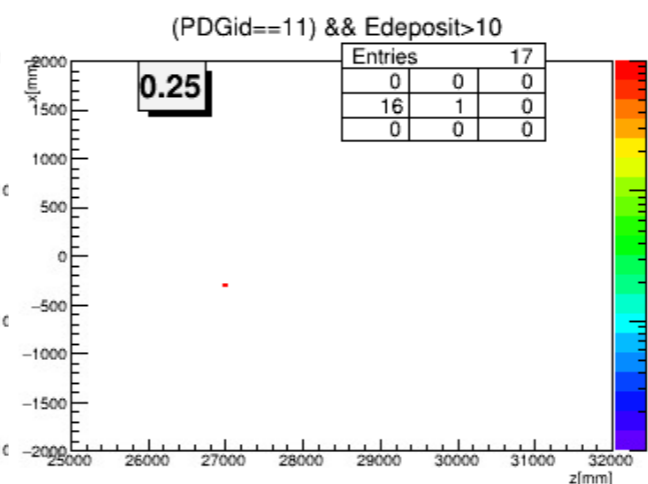
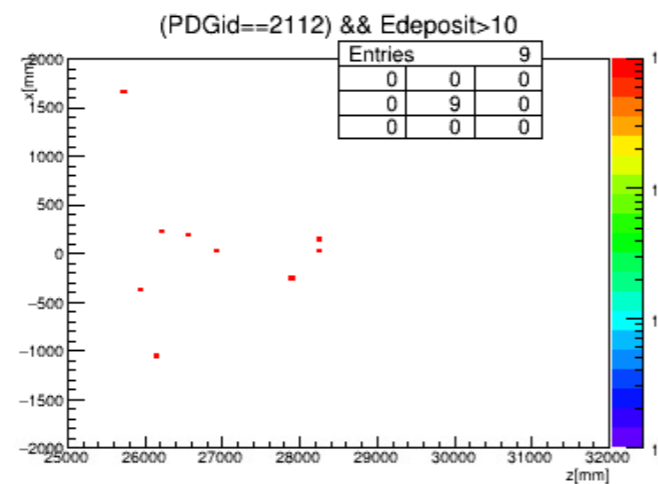
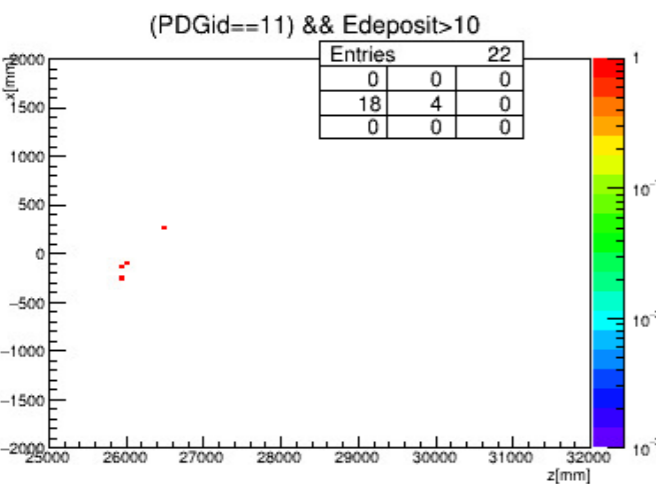
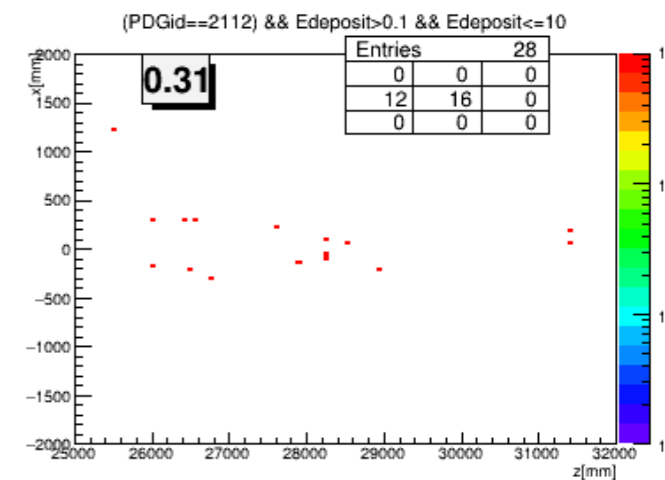
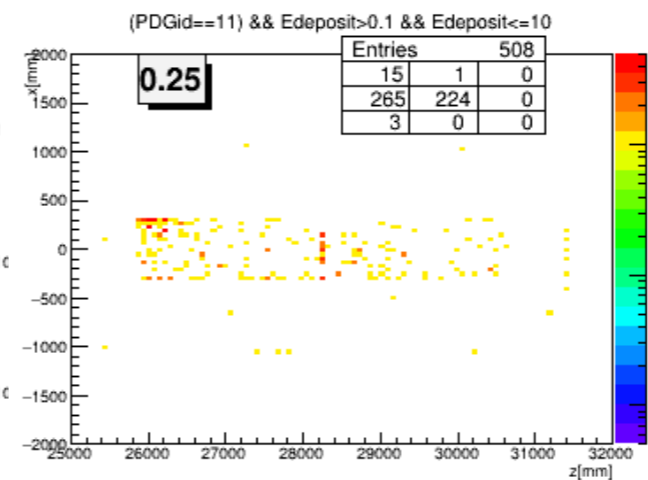
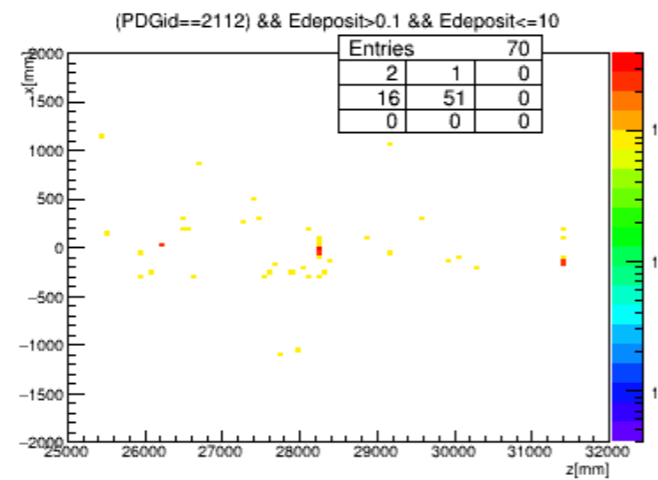
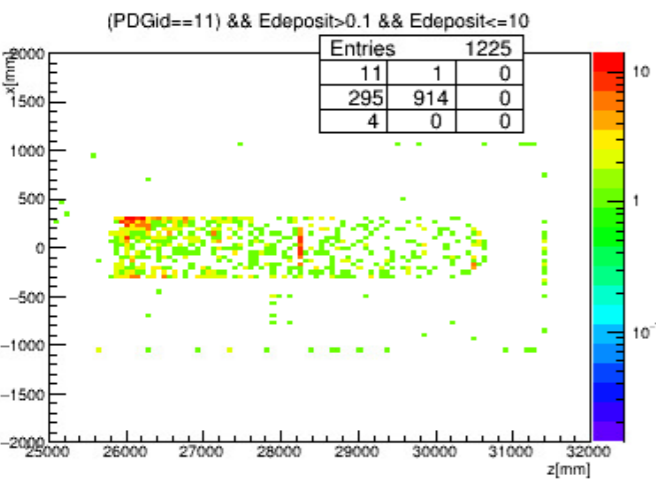
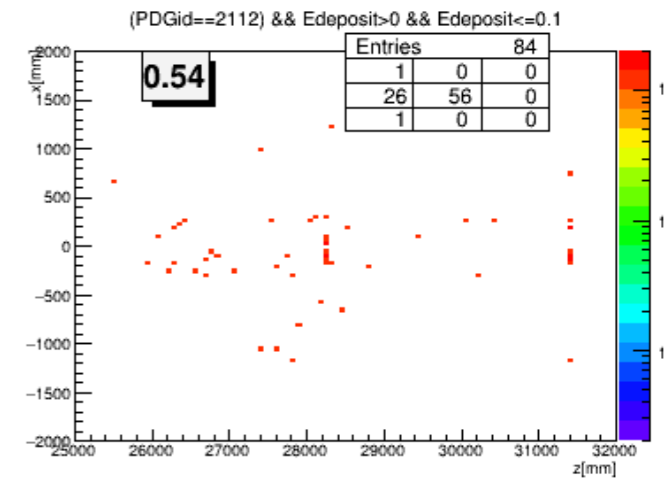
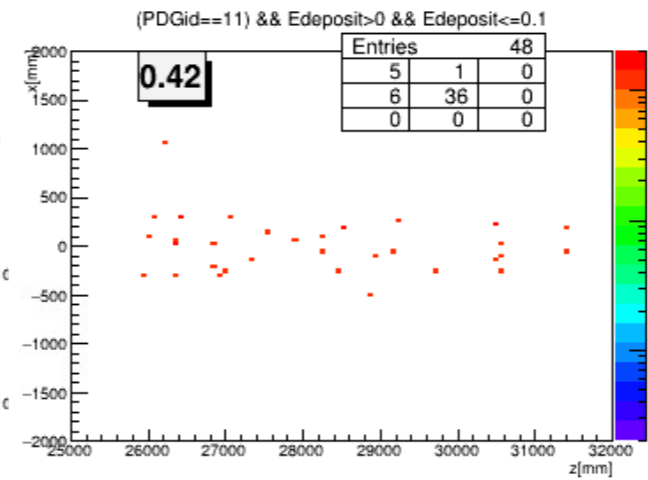
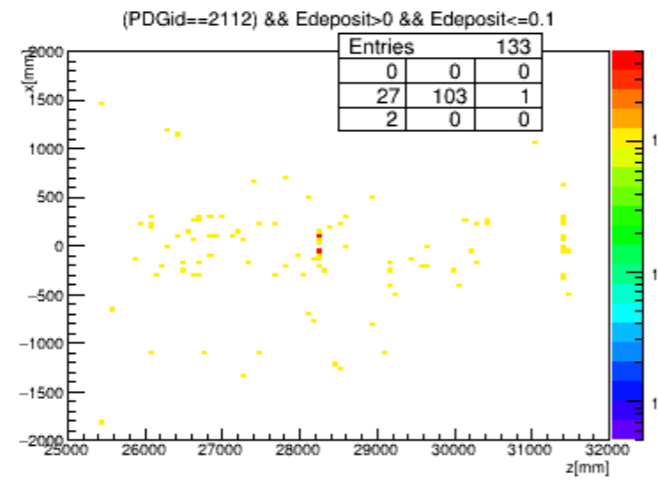
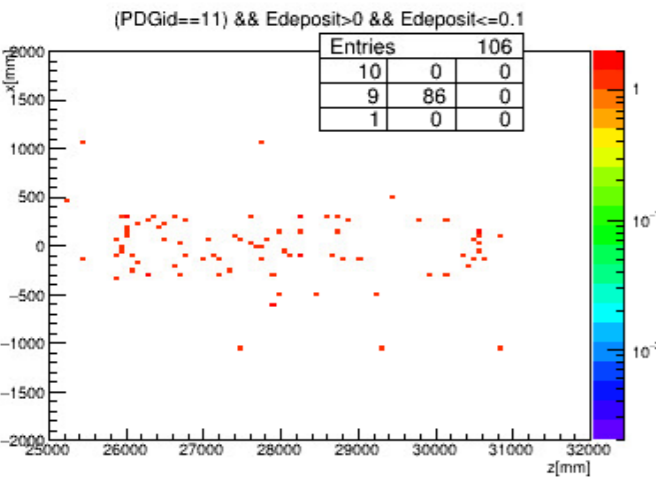
current setup



PREX1 dump configuration

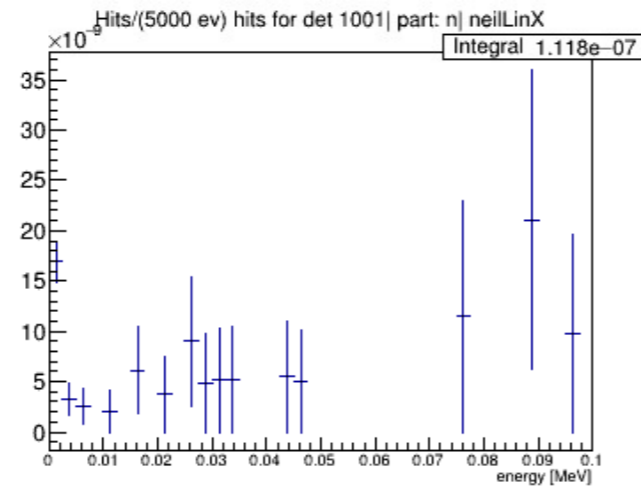
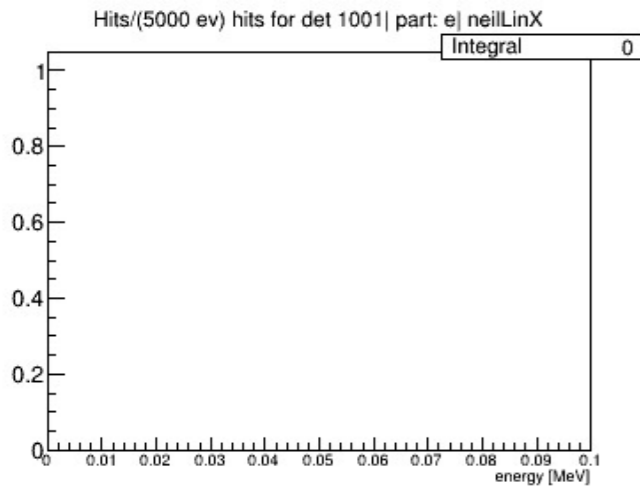
PREX2 - comparison

current setup

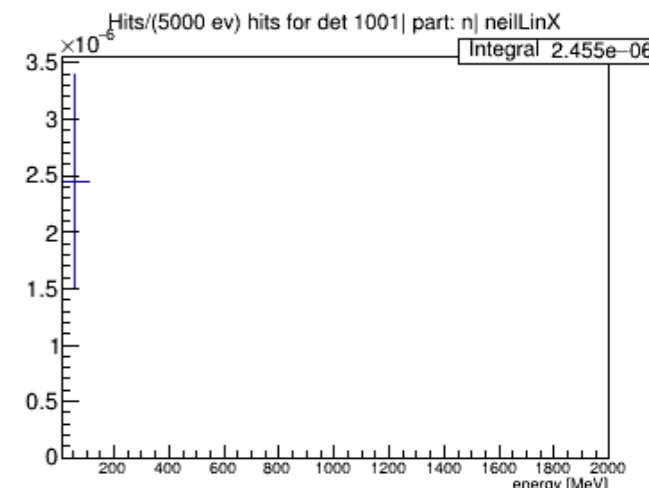
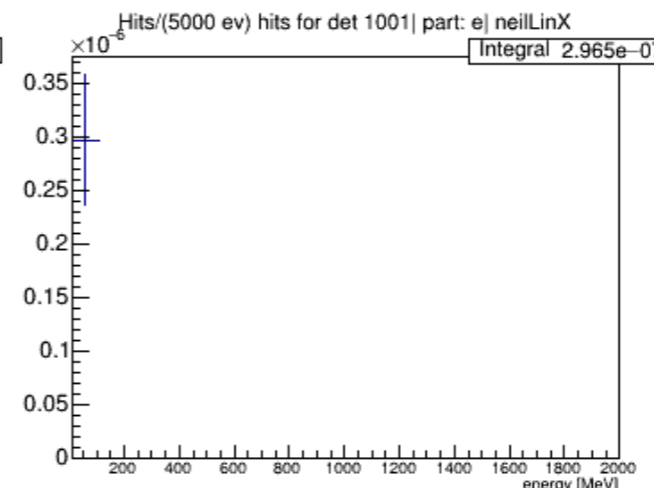
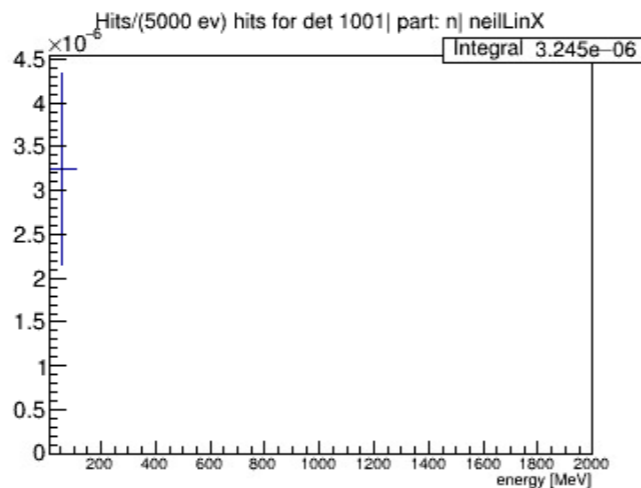
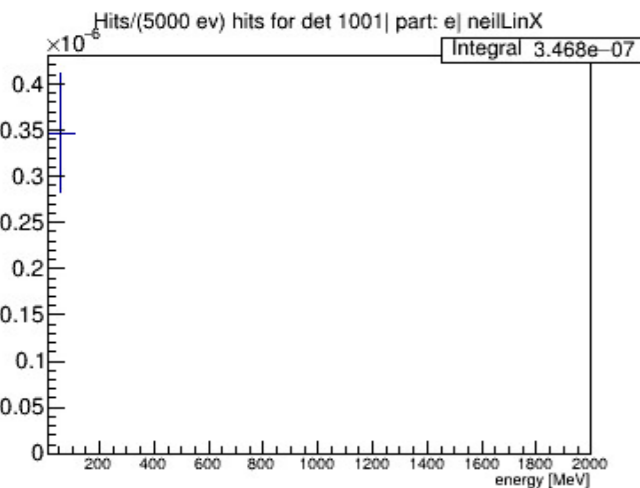
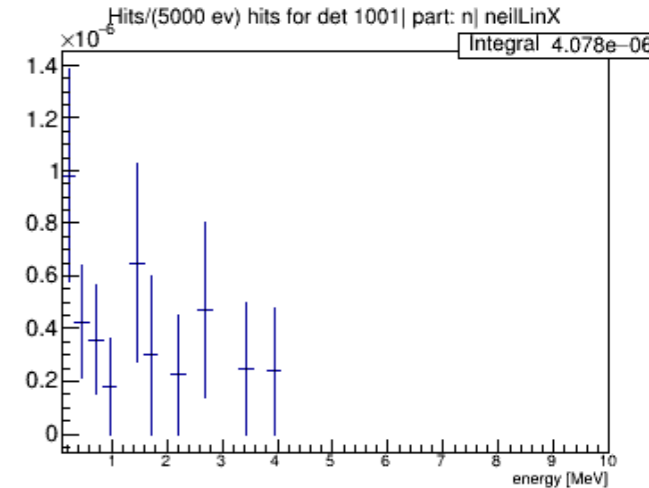
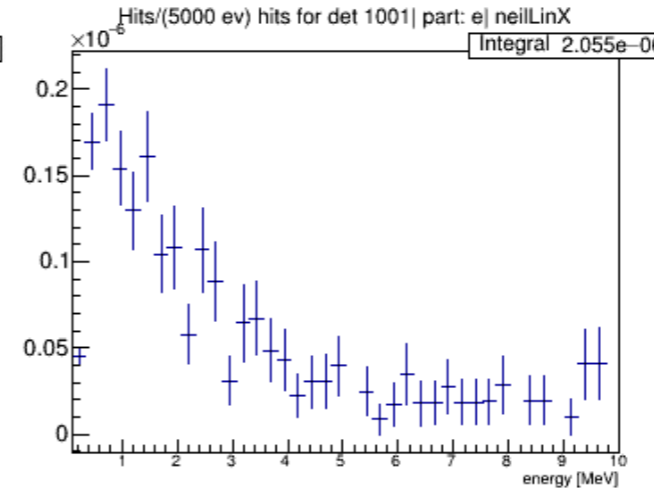
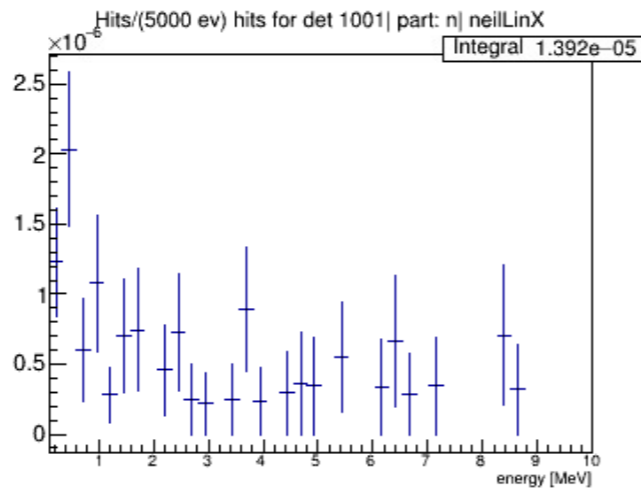
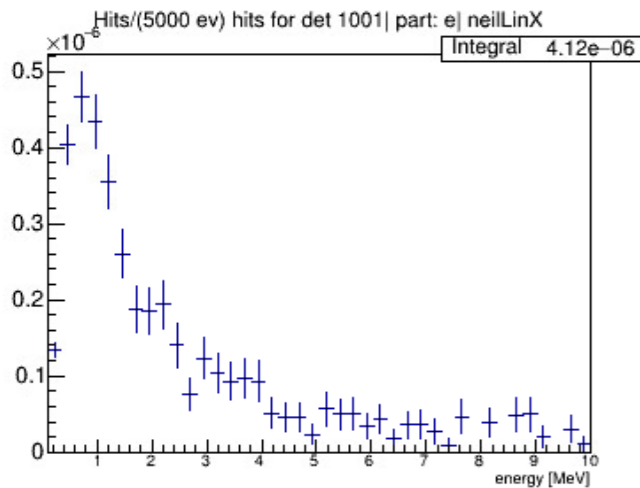
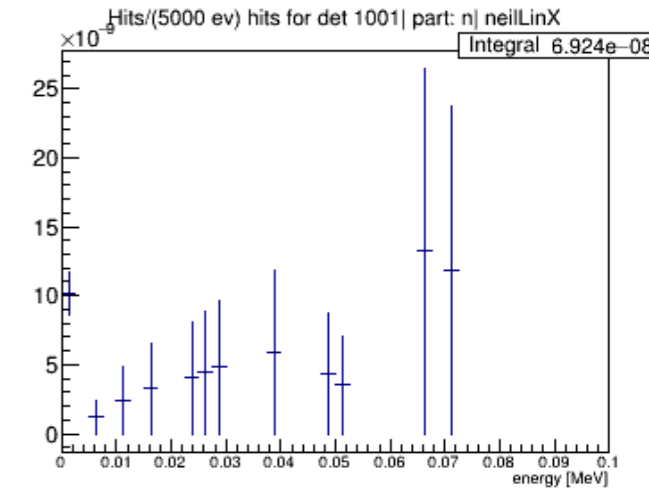
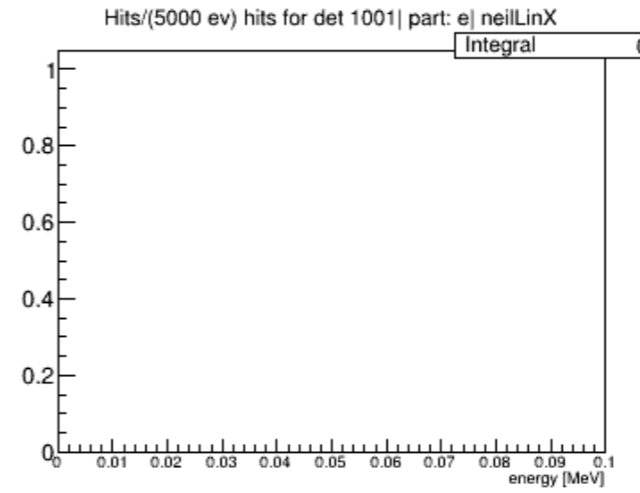


PREX2 - comparison

current setup

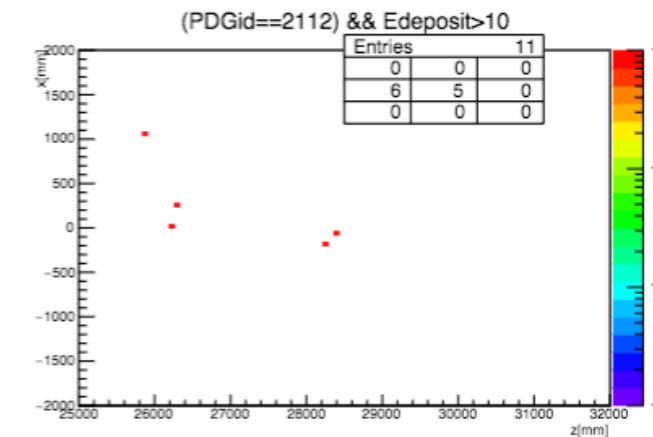
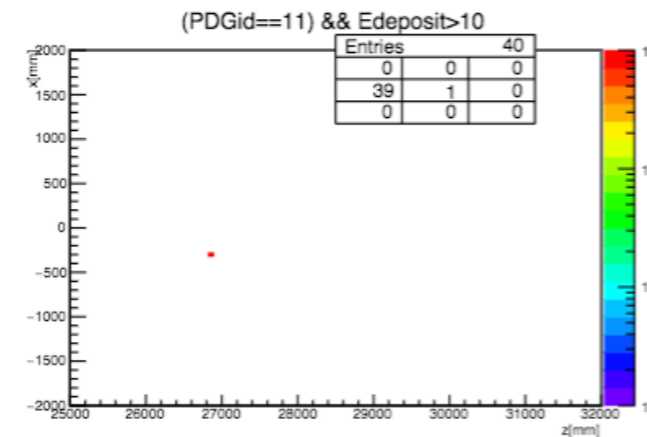
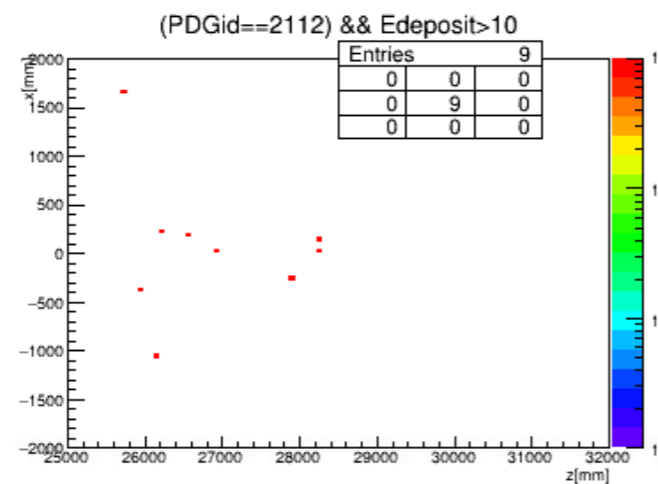
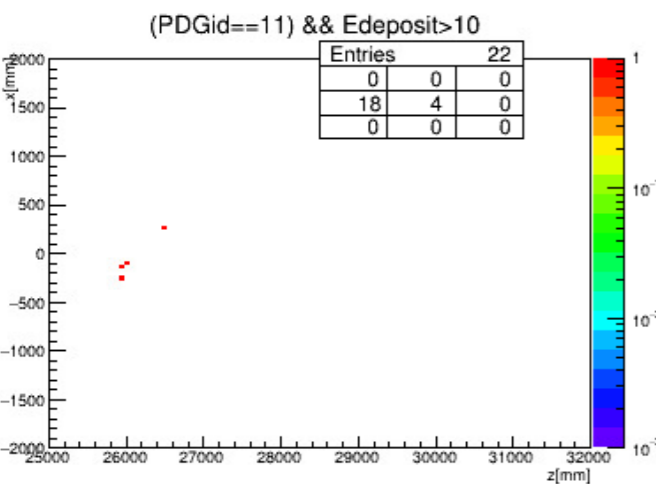
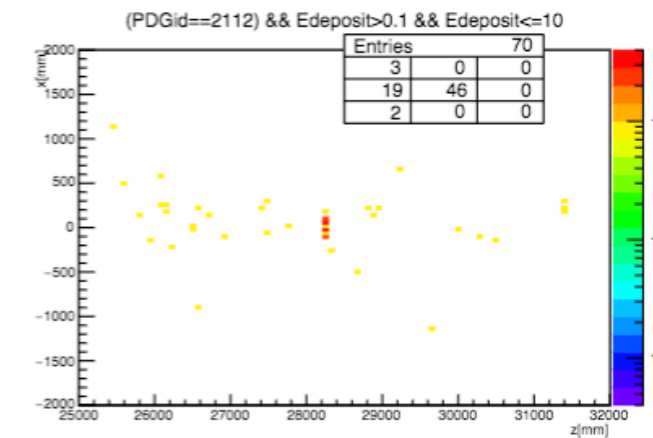
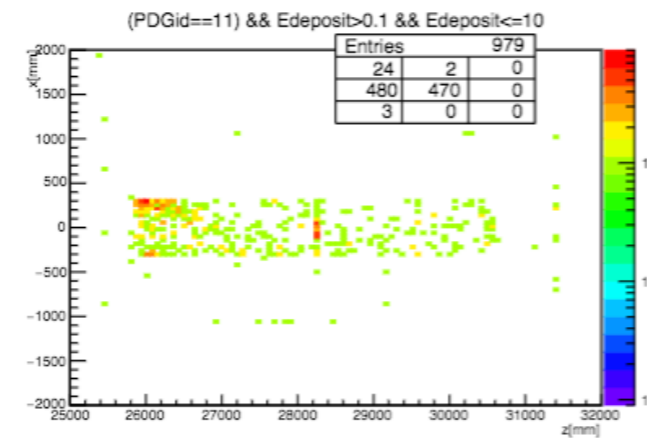
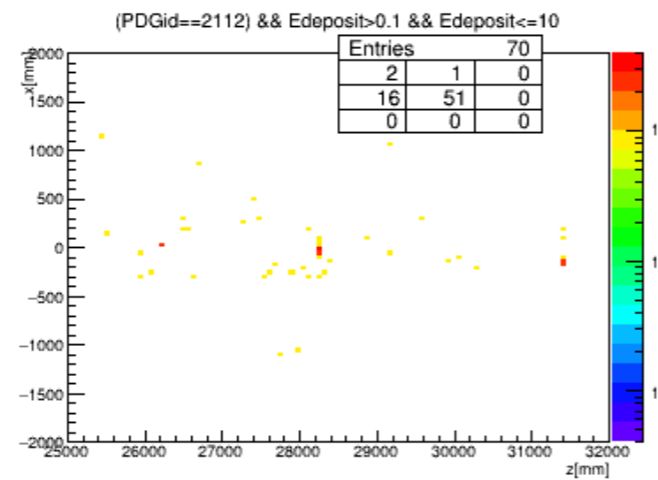
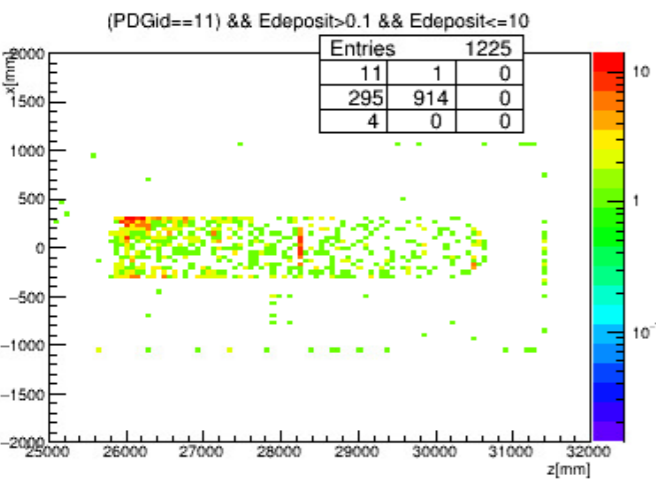
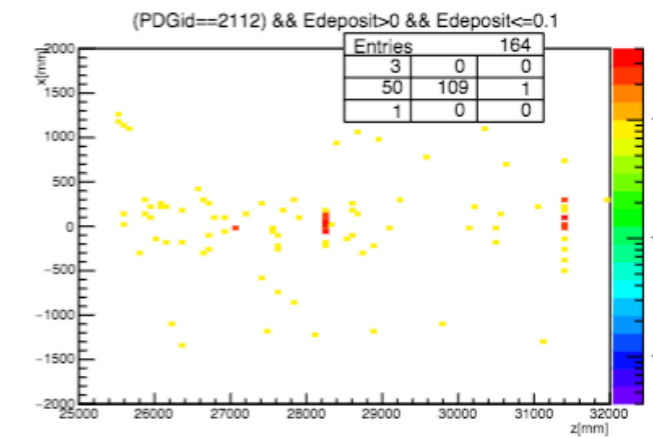
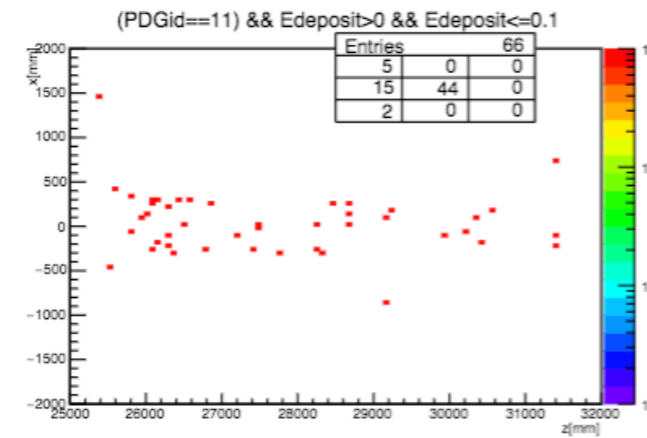
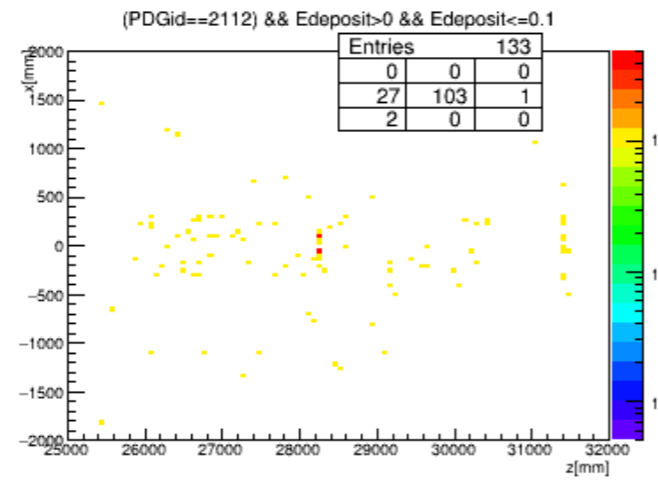
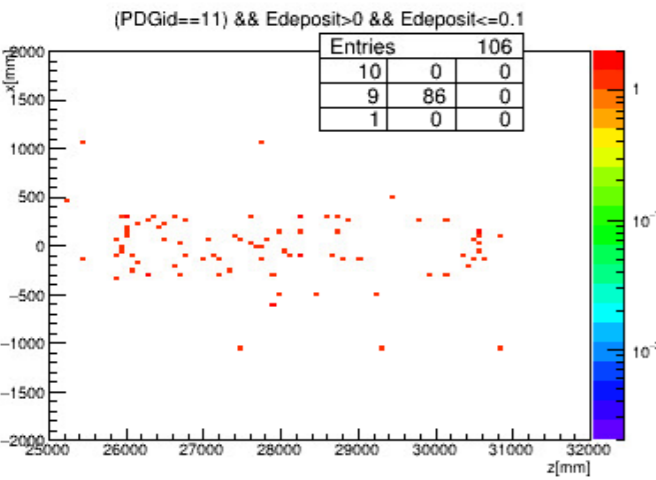


current setup + 1 ft concrete shield



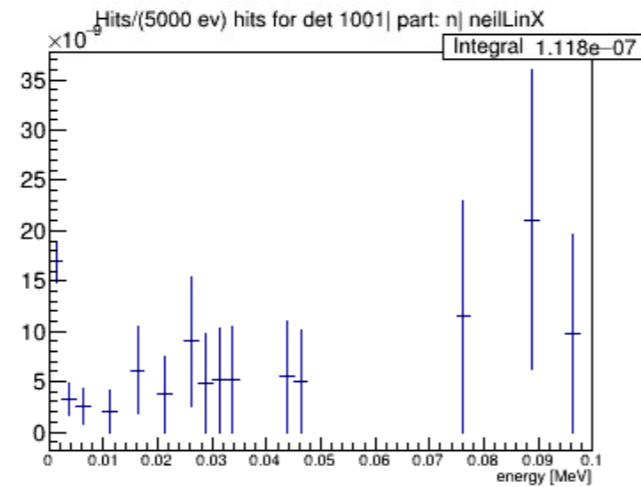
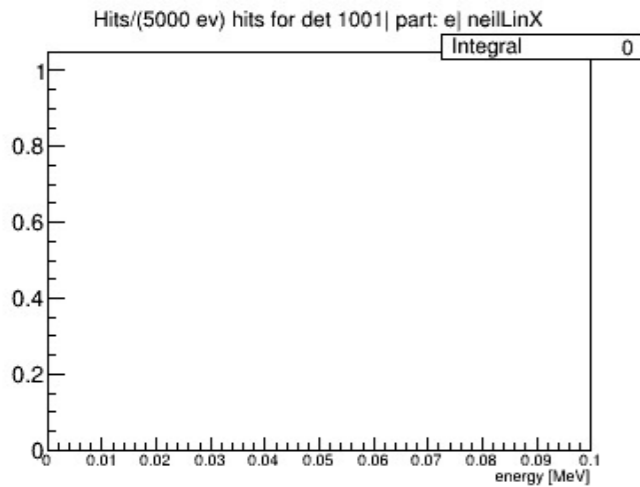
PREX2 - comparison

current setup

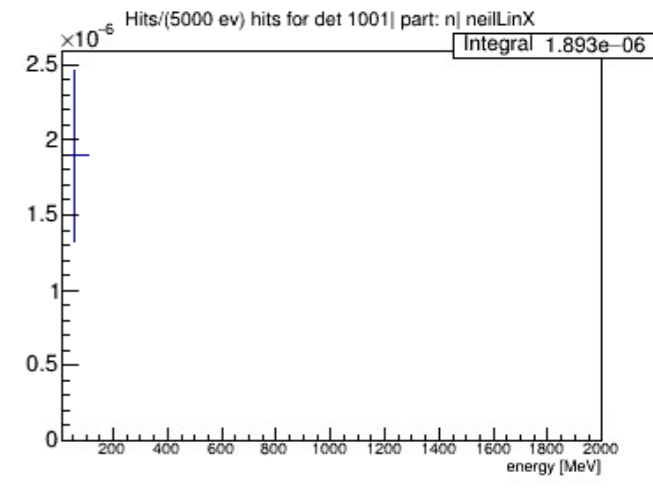
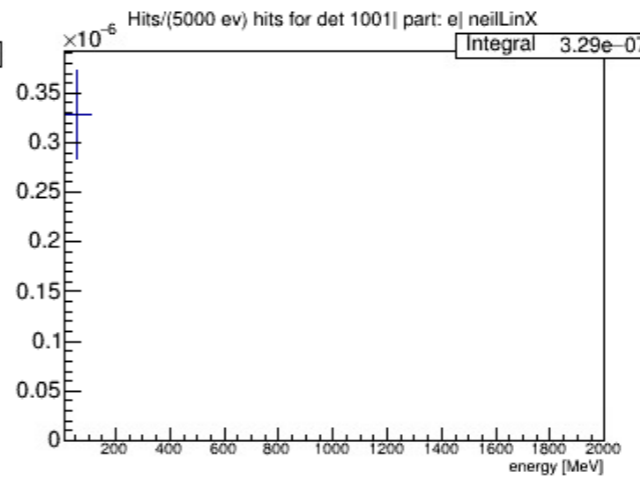
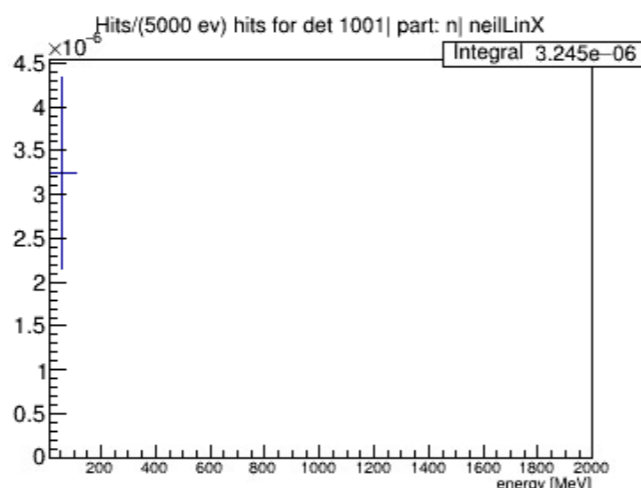
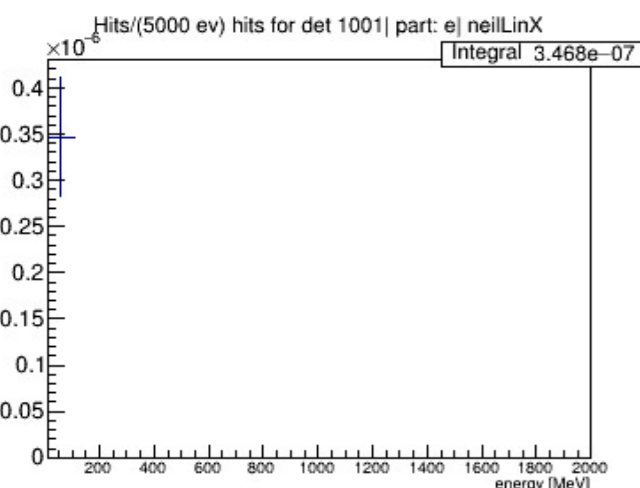
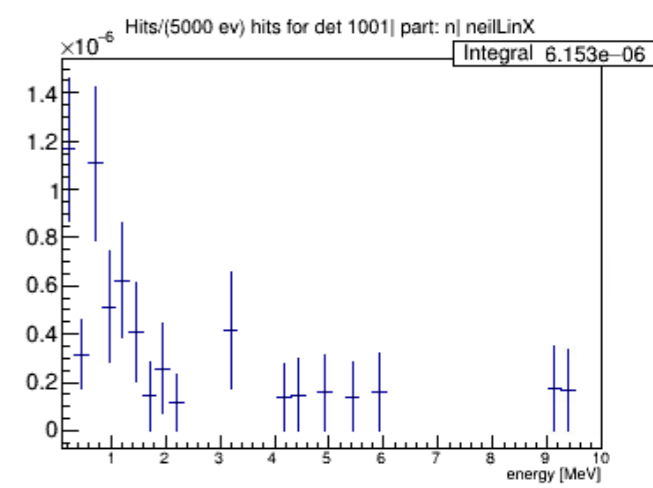
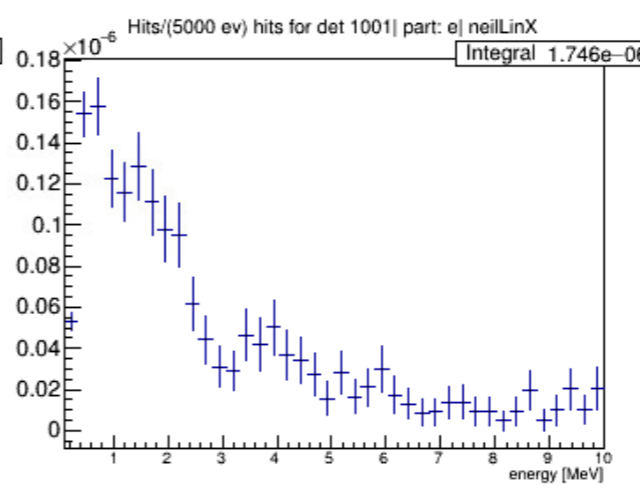
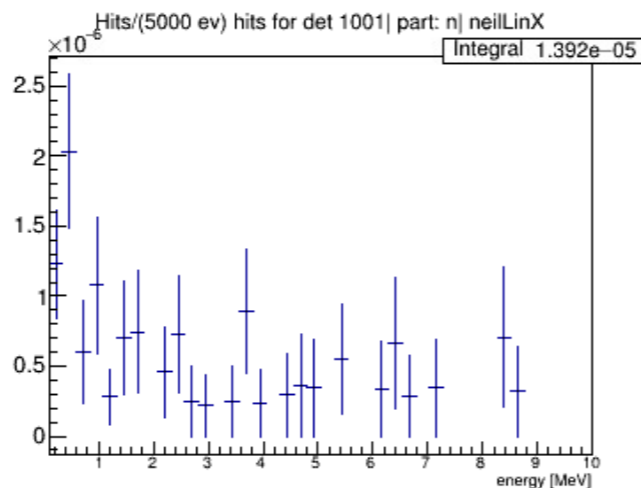
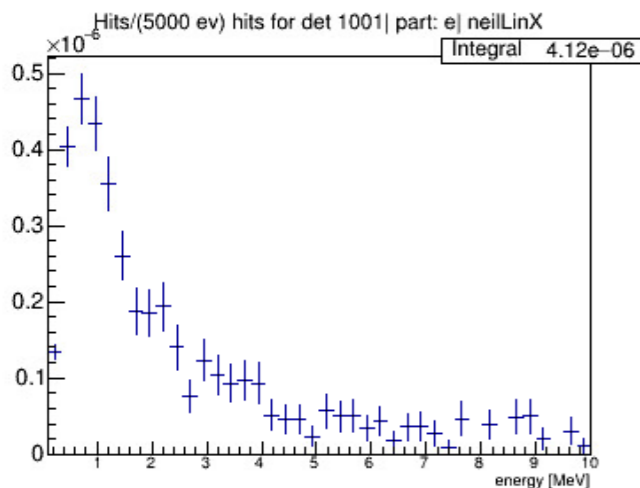
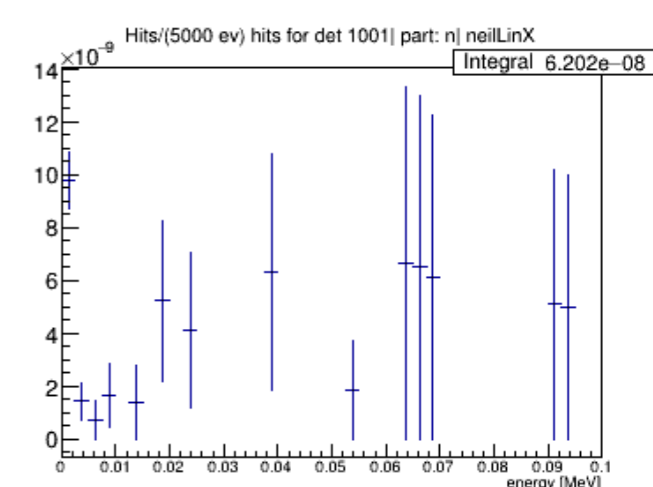
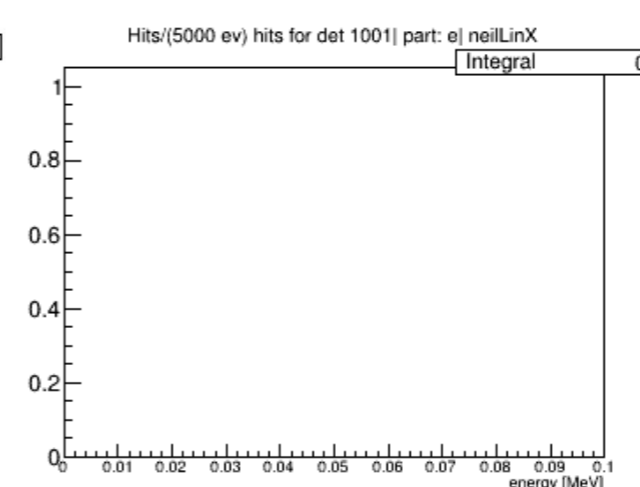


PREX2 - comparison

current setup

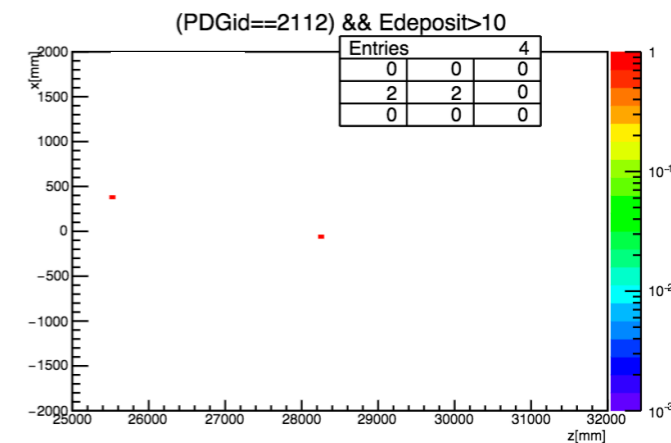
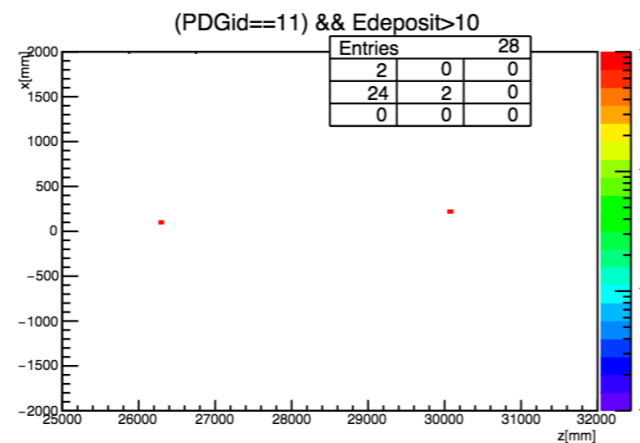
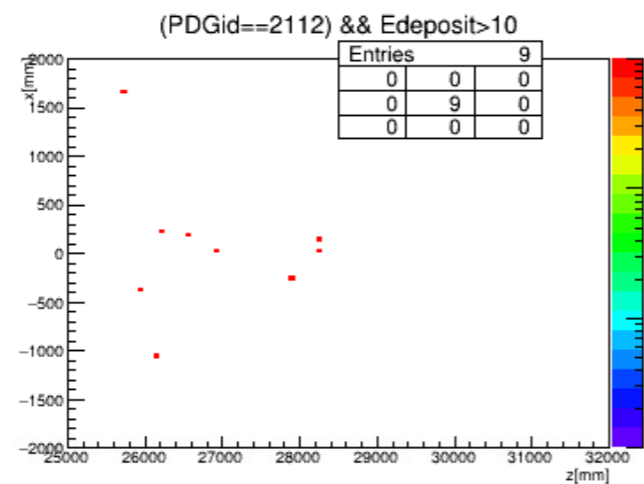
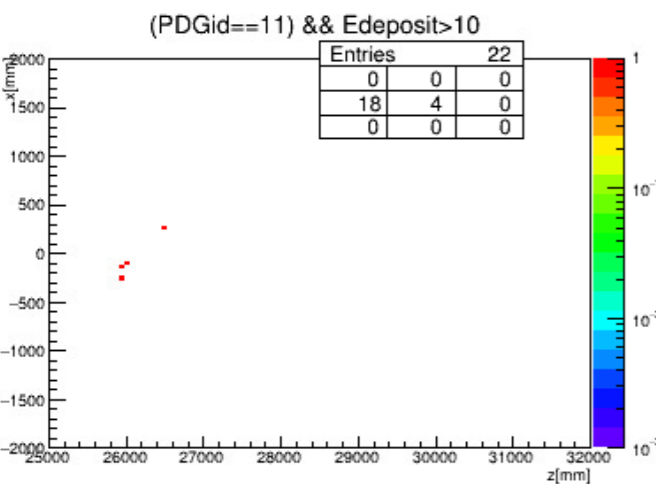
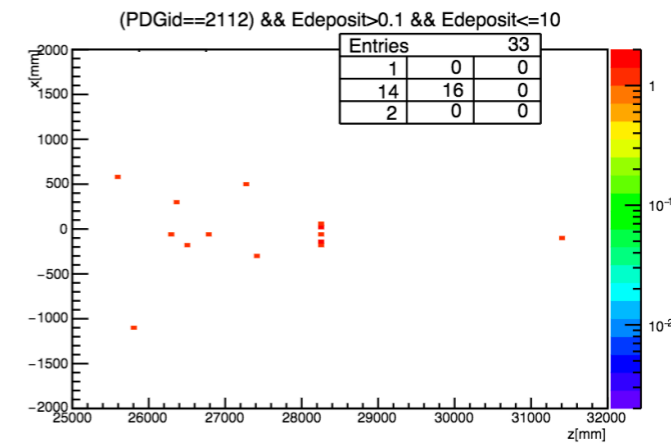
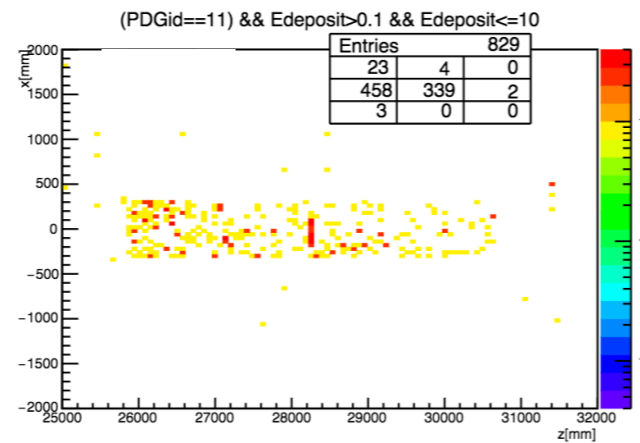
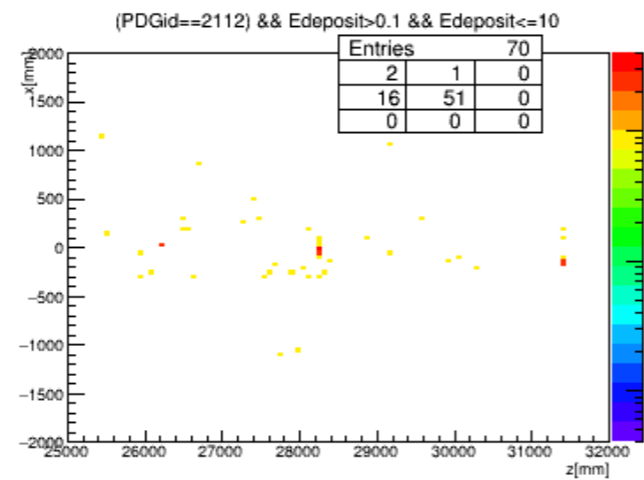
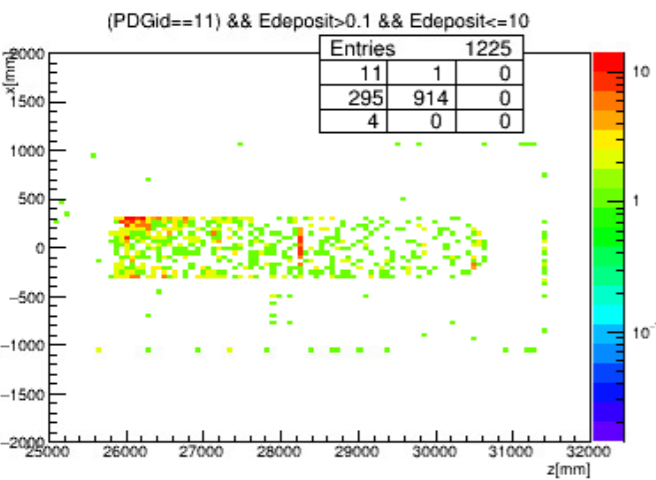
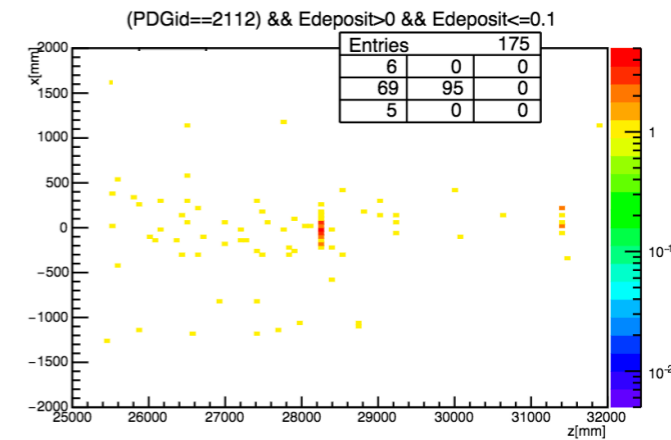
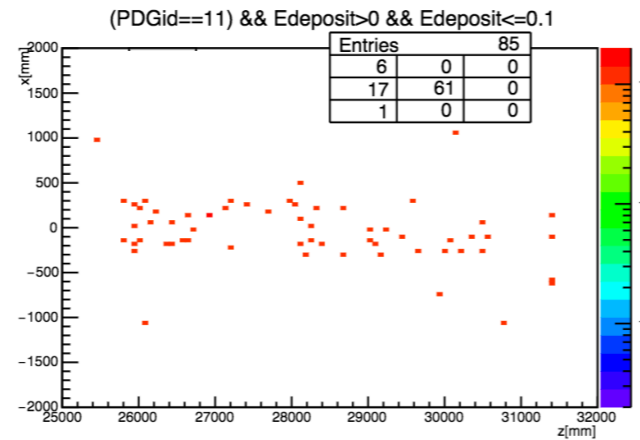
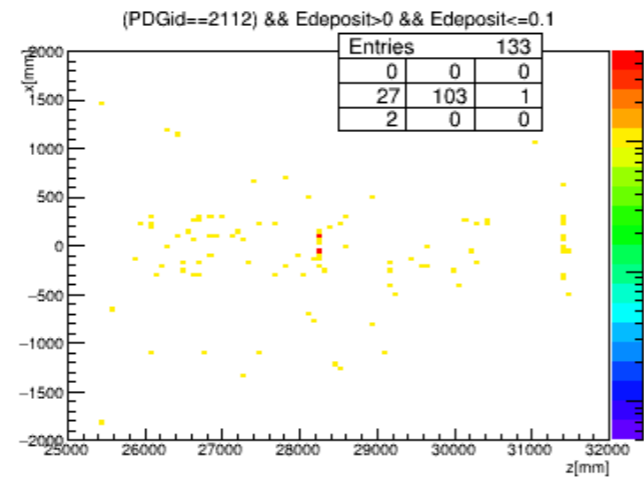
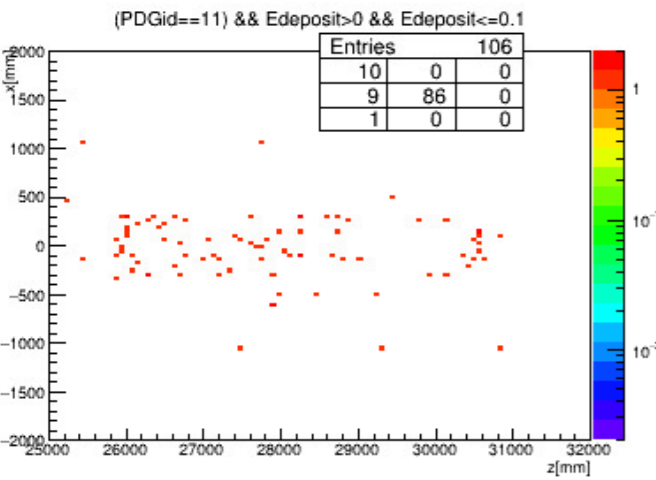


current setup + 0.5 ft concrete shield



PREX2 - comparison

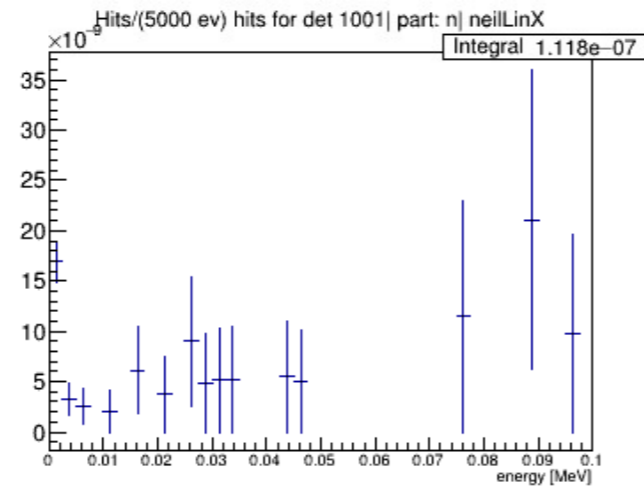
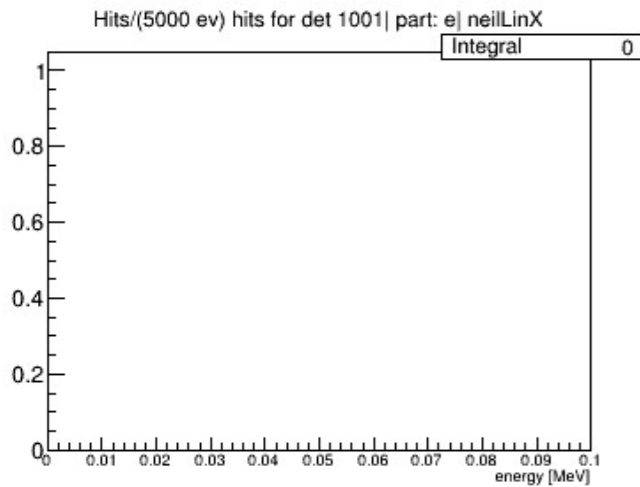
current setup



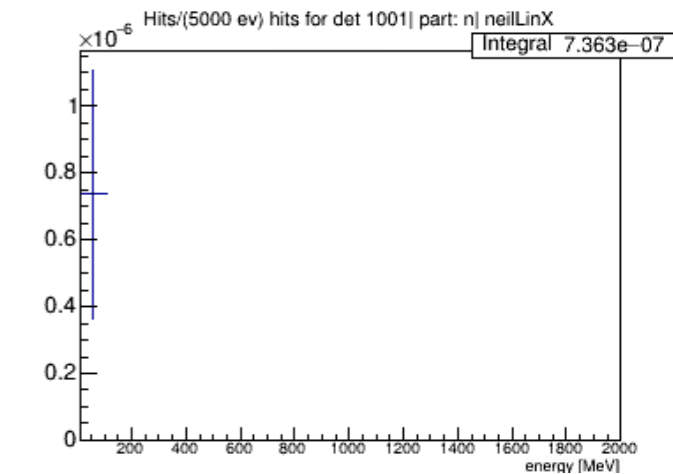
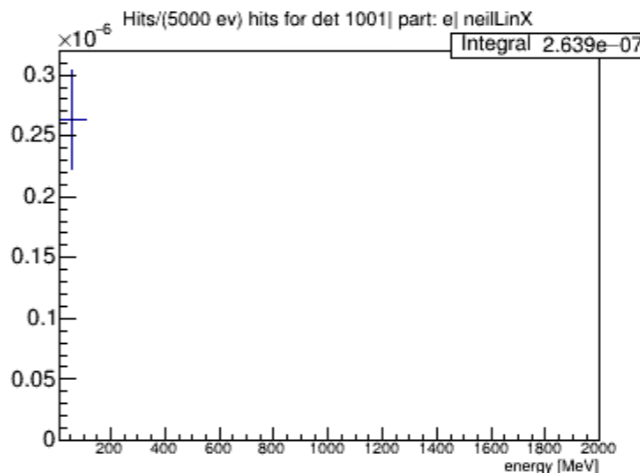
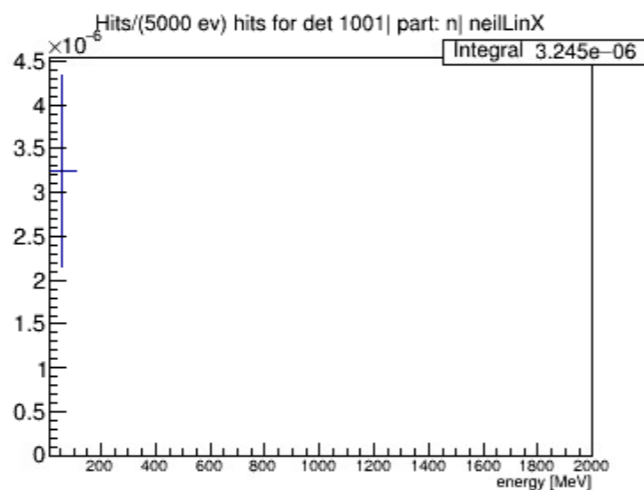
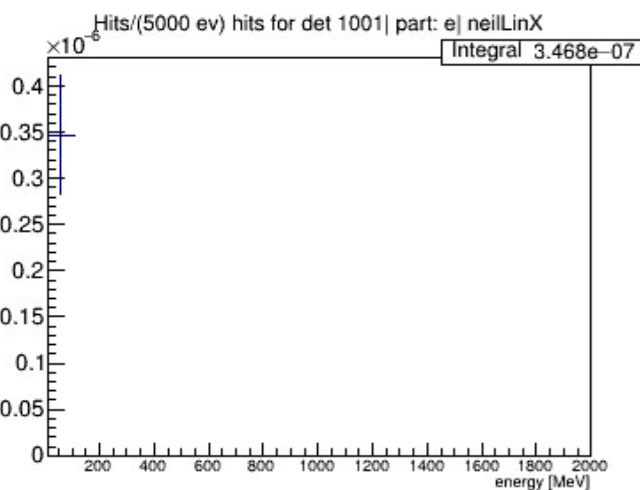
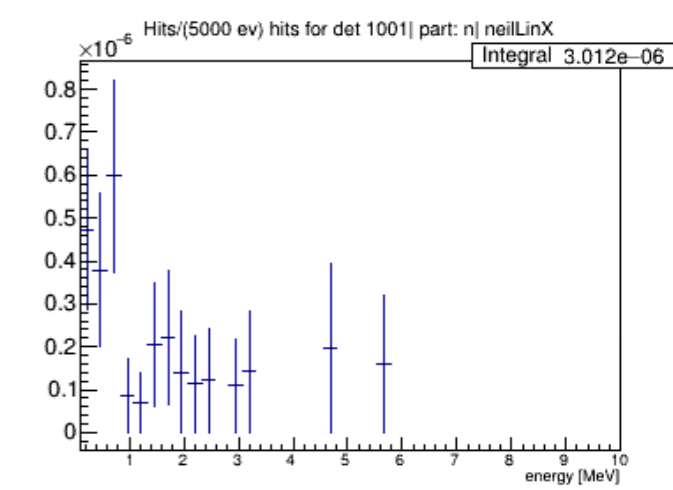
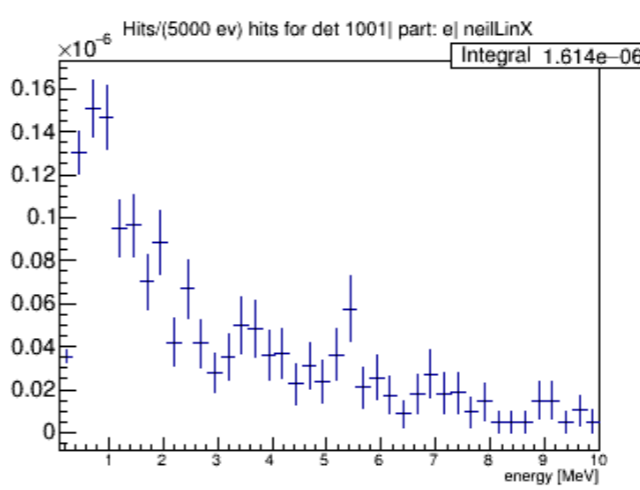
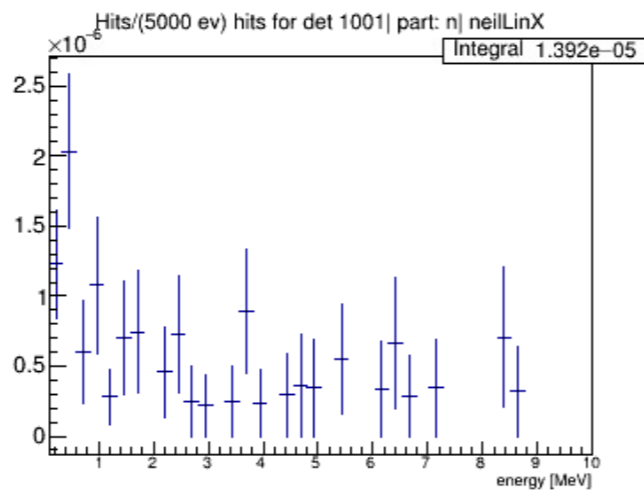
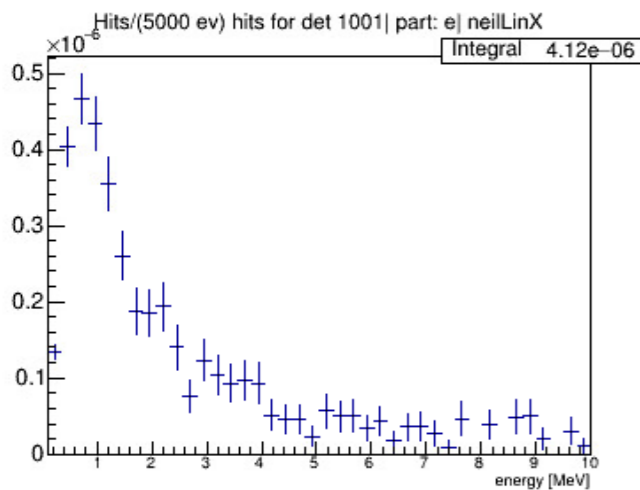
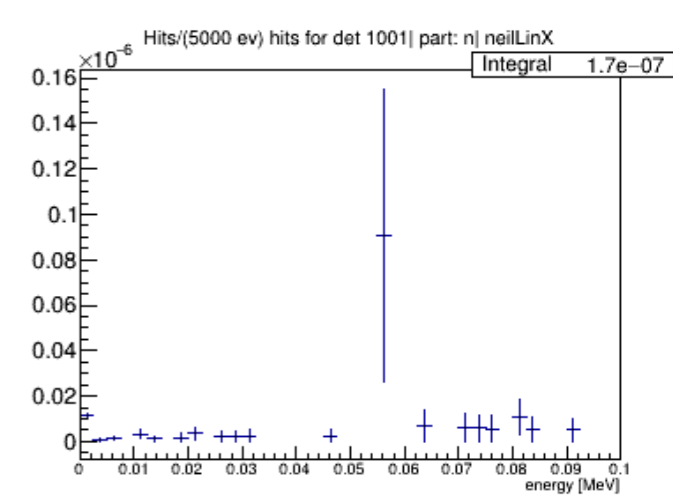
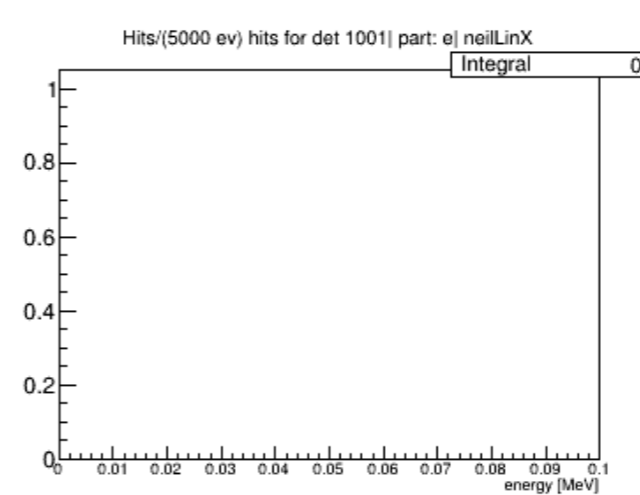
current setup + 2 ft concrete shield (2x stat)

PREX2 - comparison

current setup

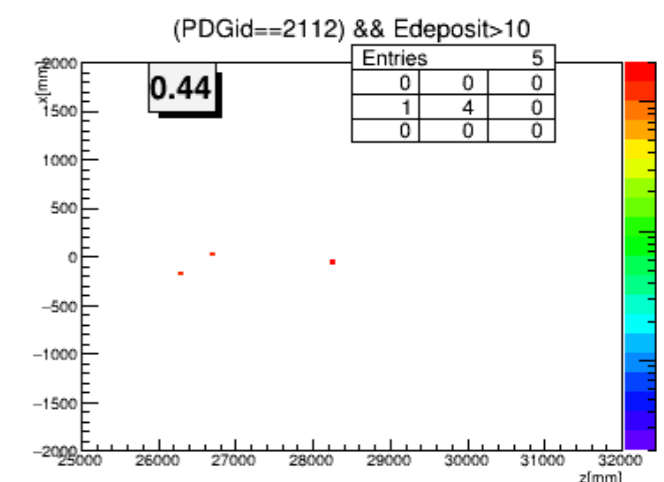
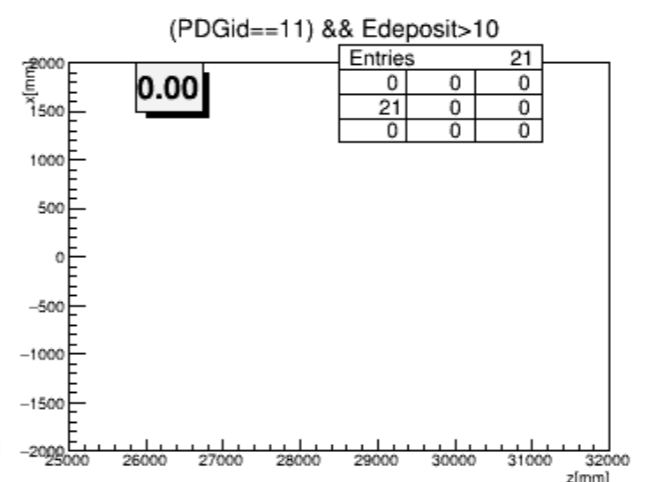
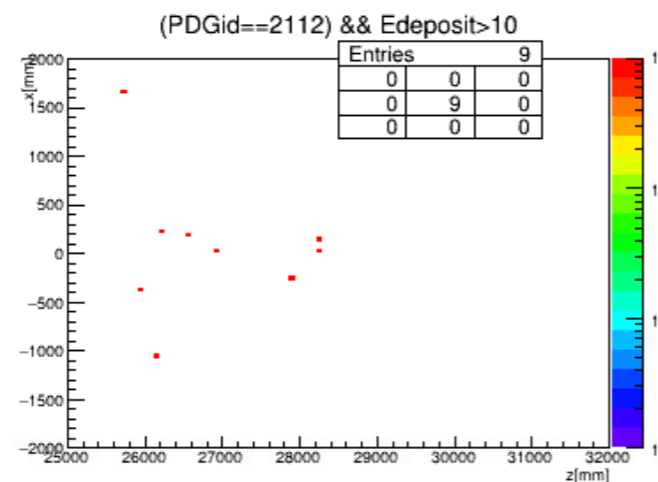
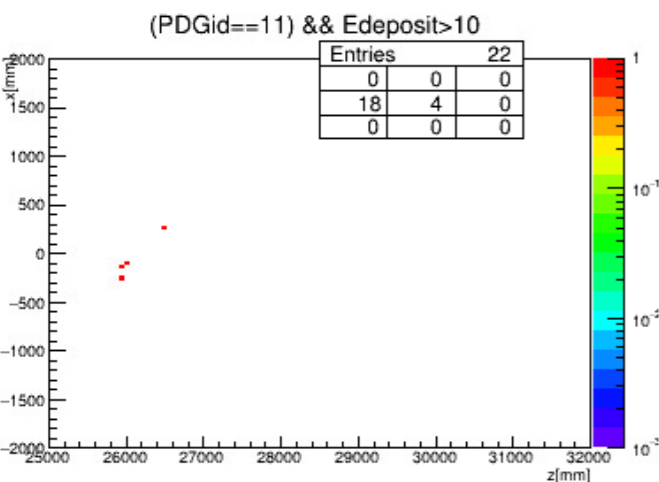
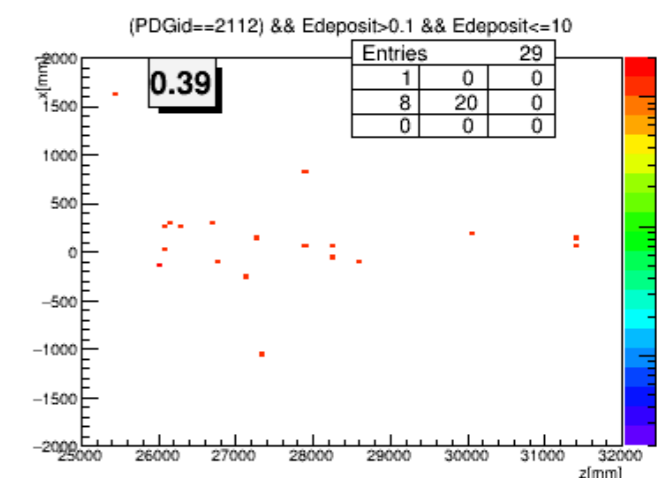
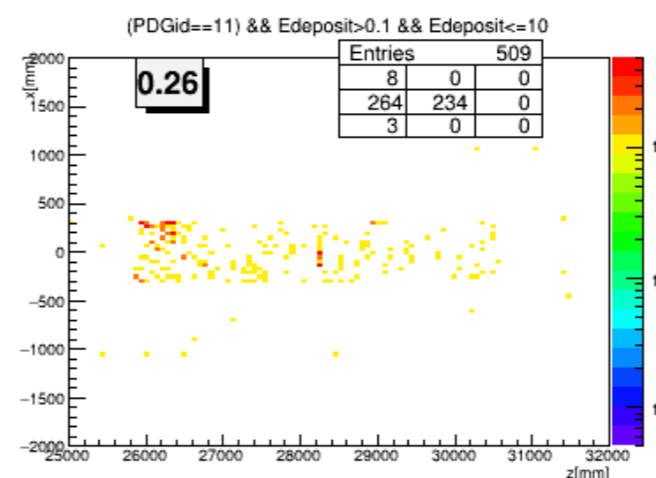
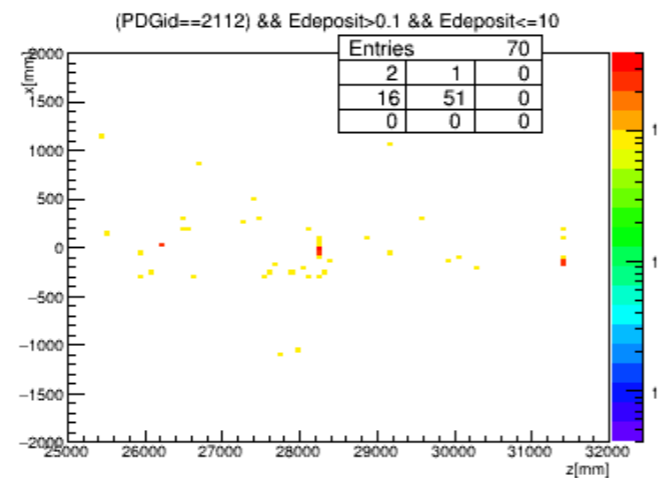
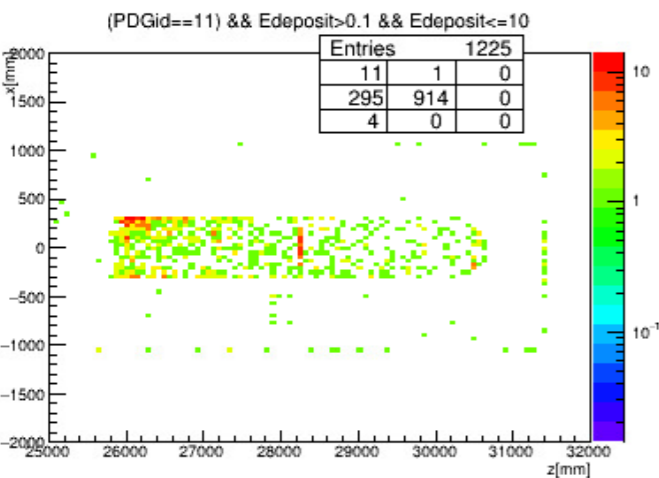
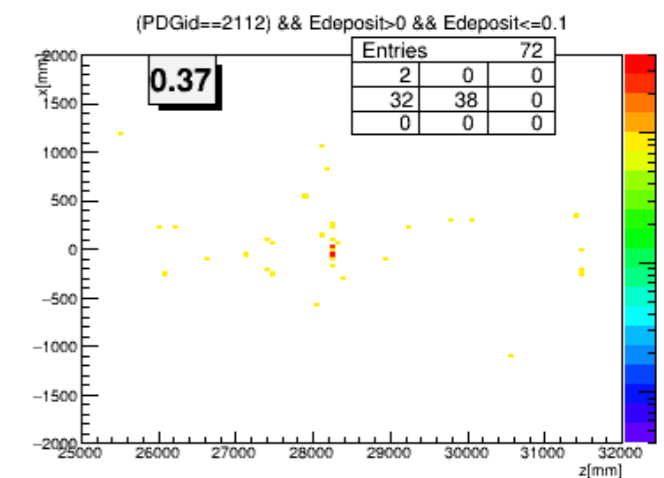
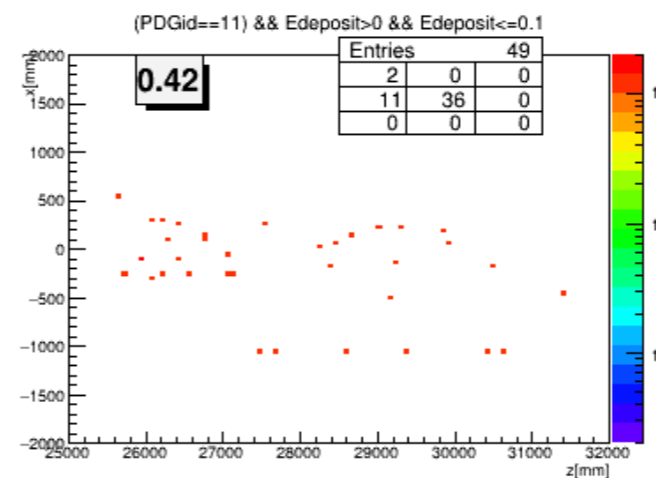
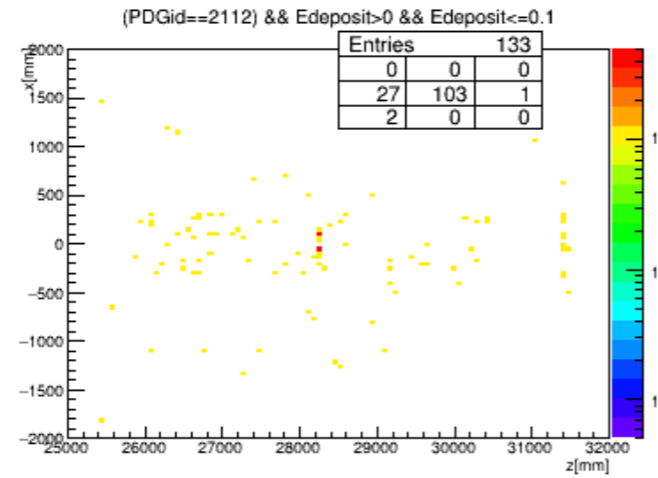
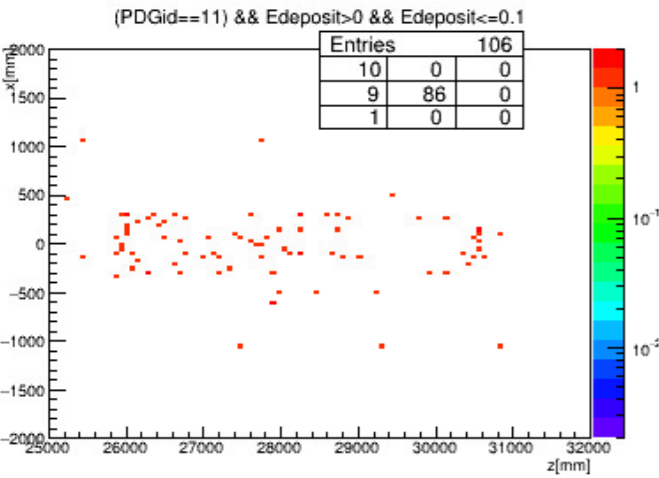


current setup + 2 ft concrete shield



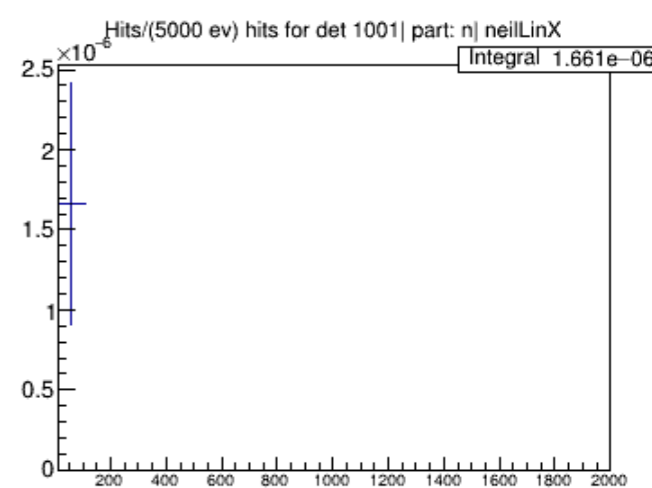
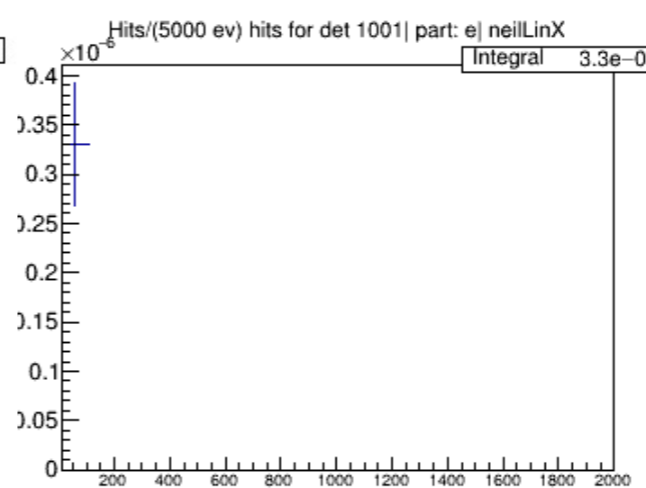
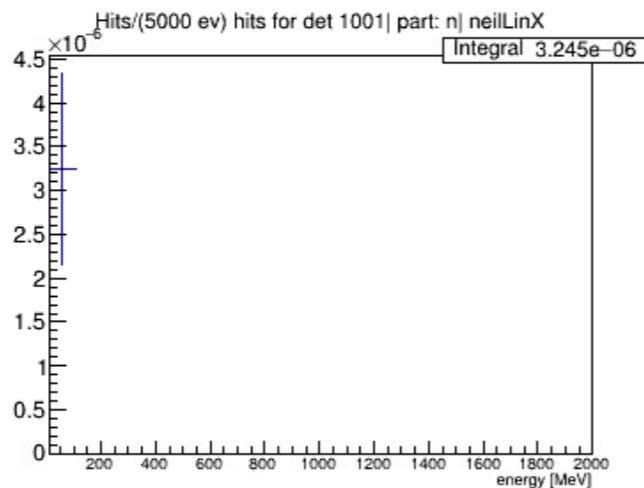
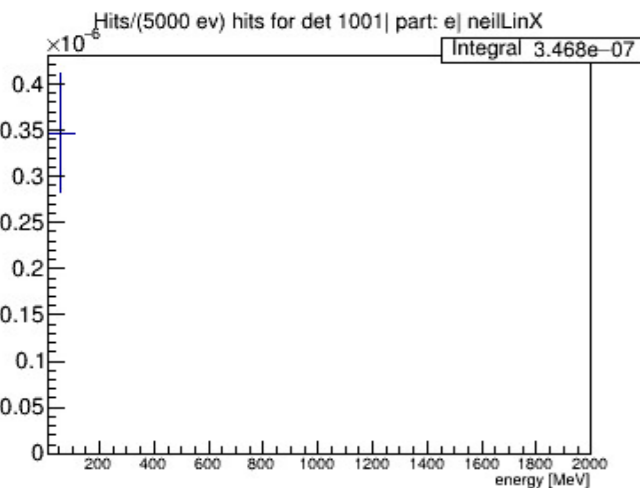
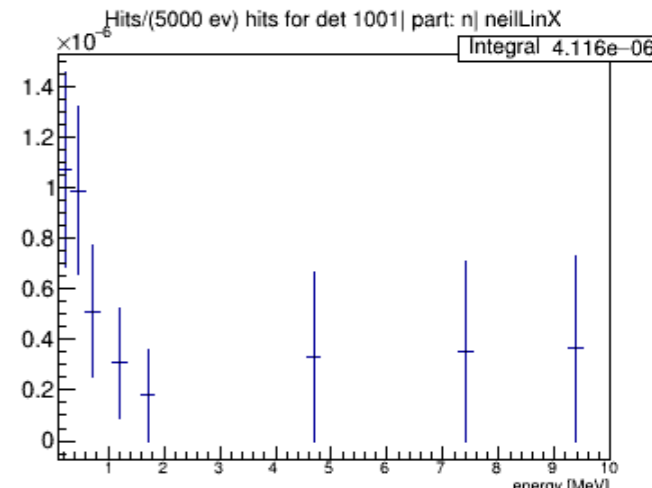
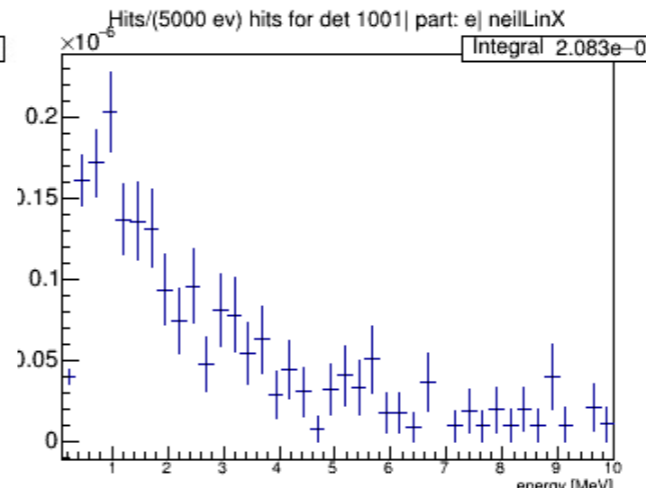
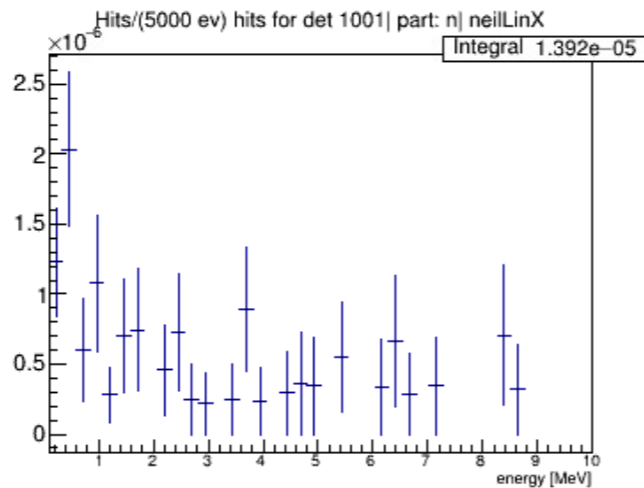
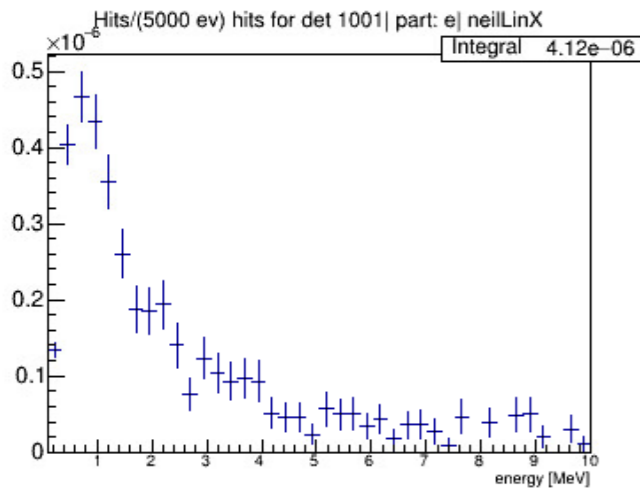
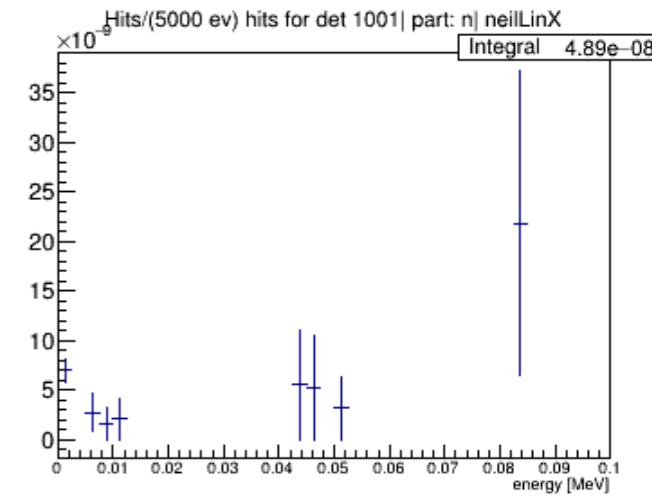
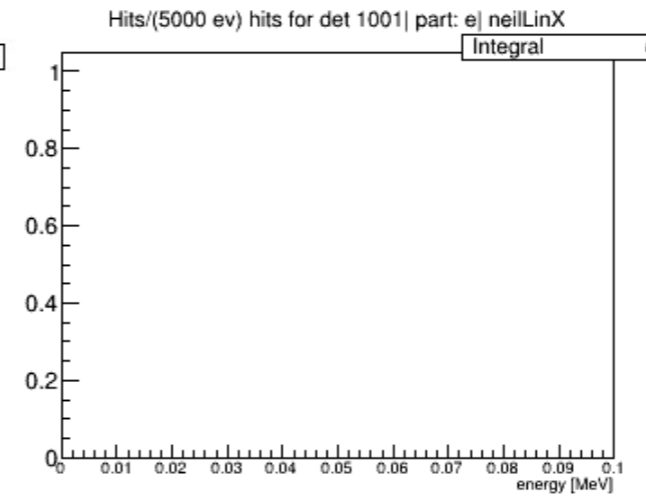
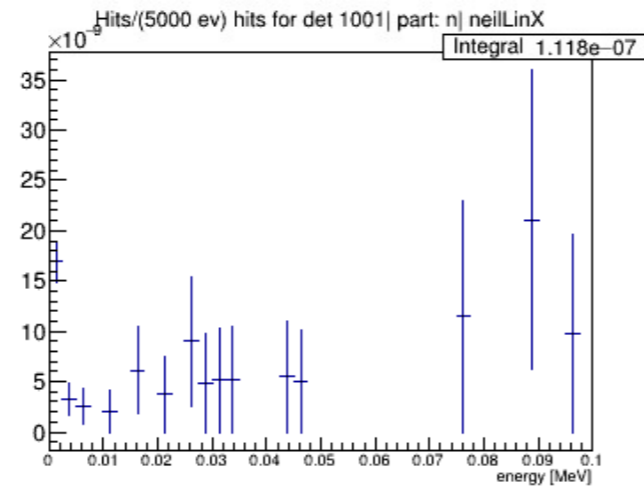
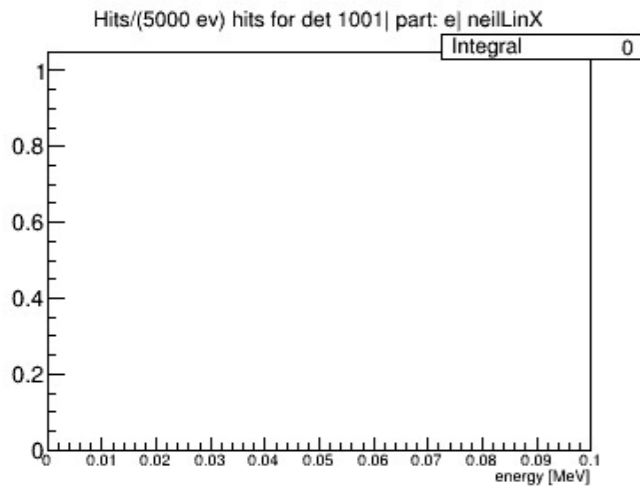
PREX2 - comparison

current setup



PREX2 - comparison

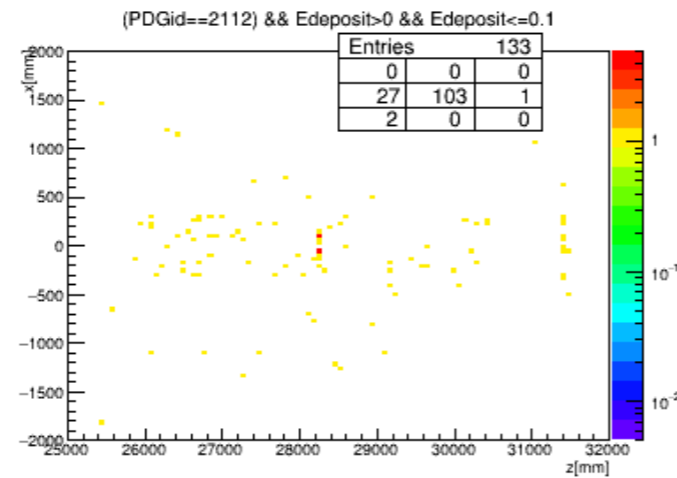
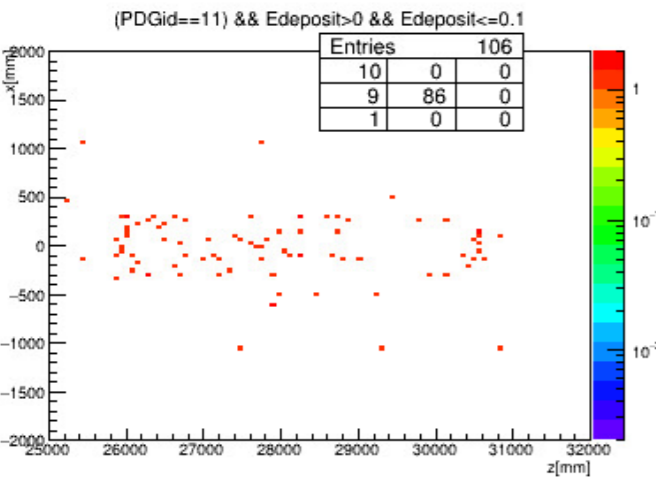
current setup



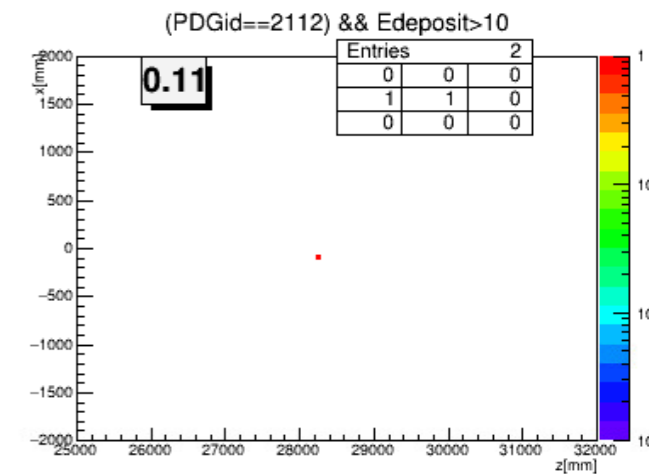
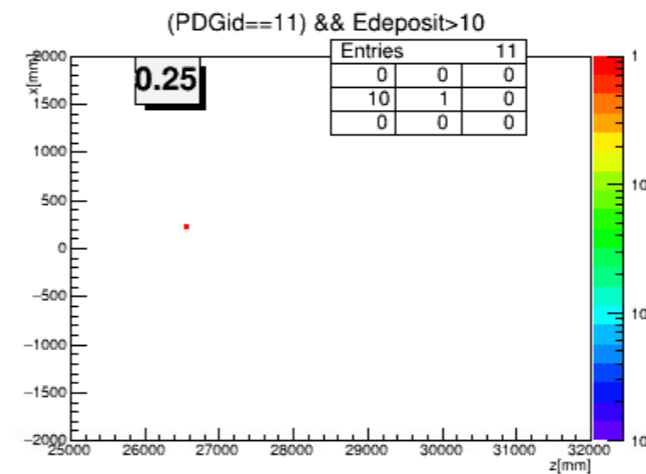
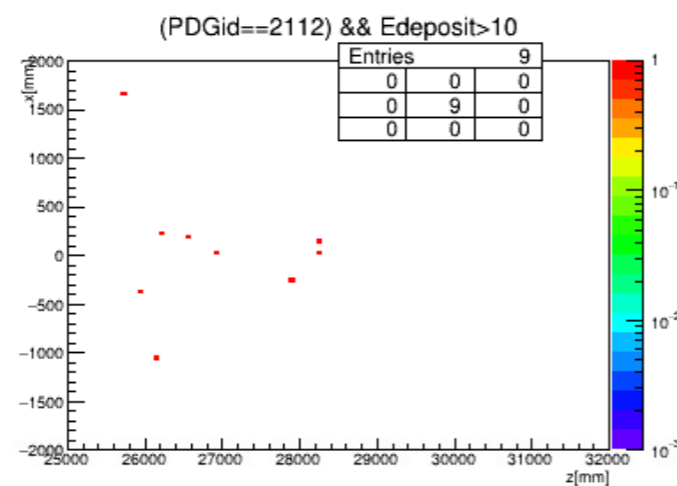
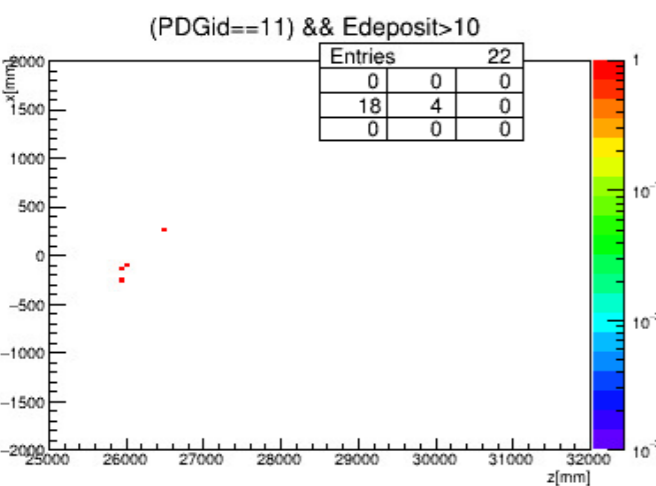
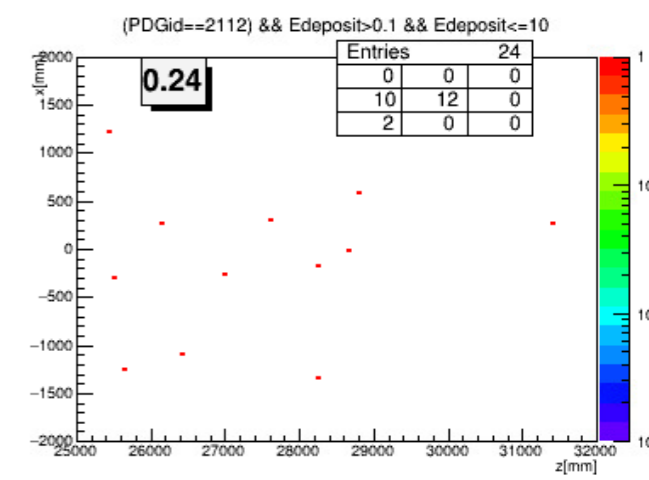
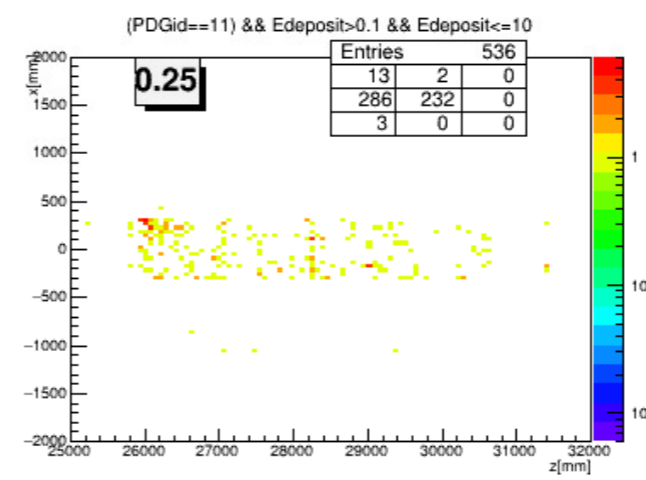
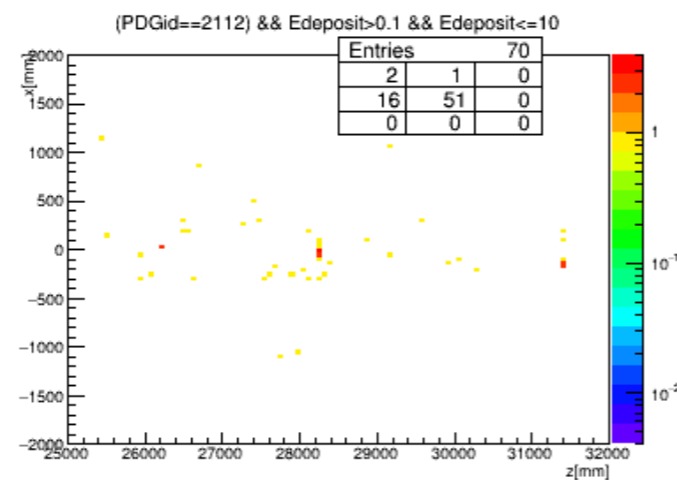
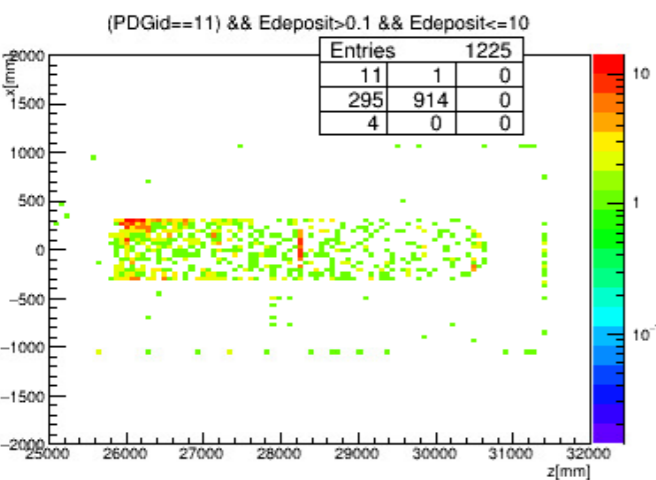
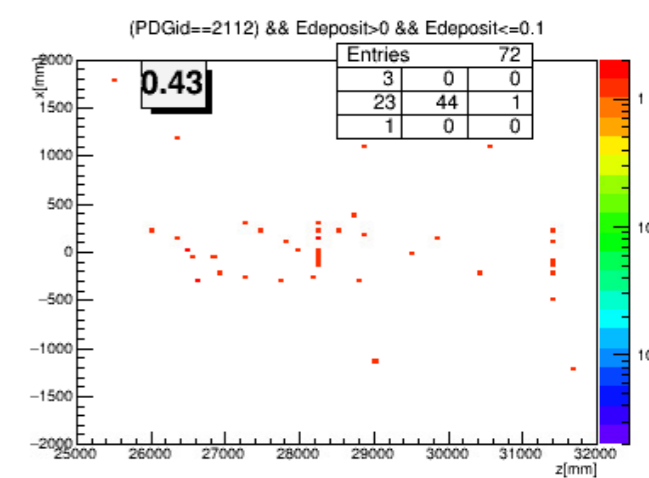
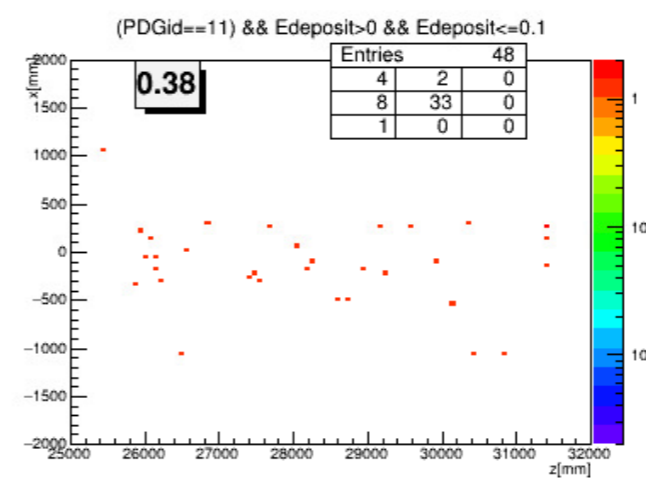
current setup + 1 ft Poly shield

PREX2 - comparison

current setup

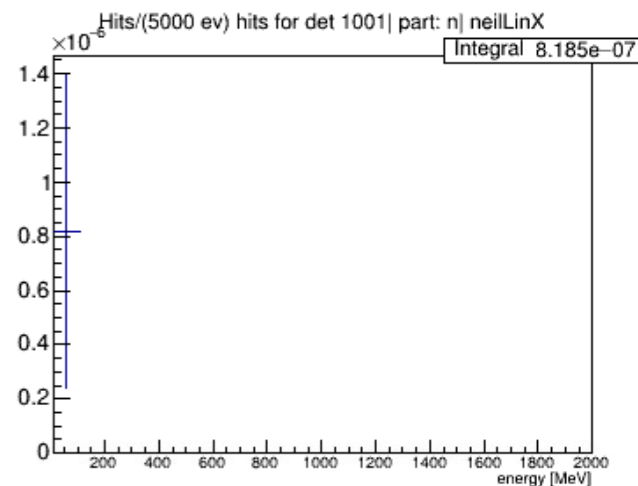
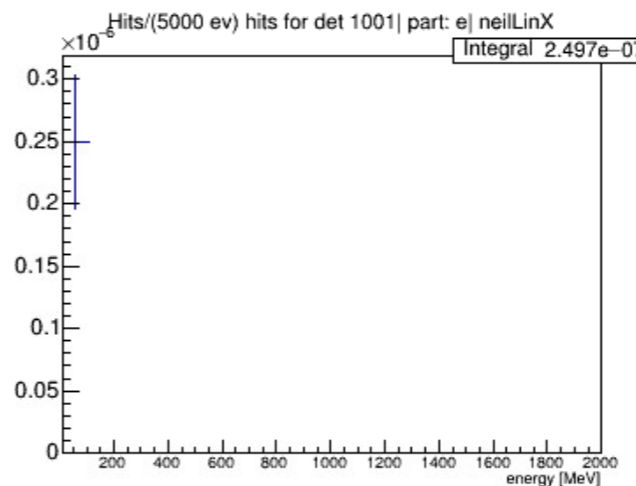
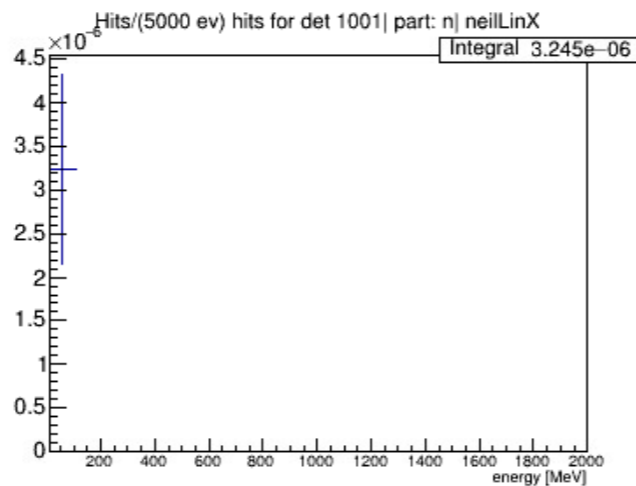
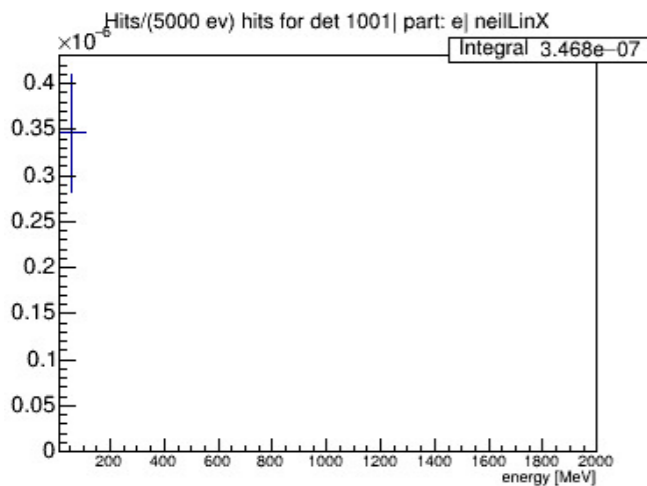
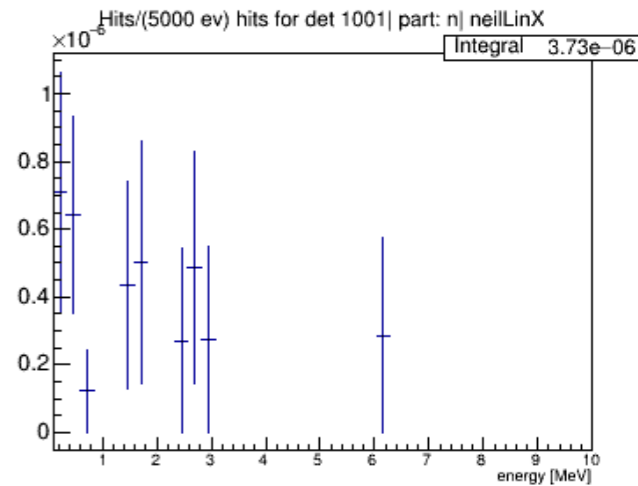
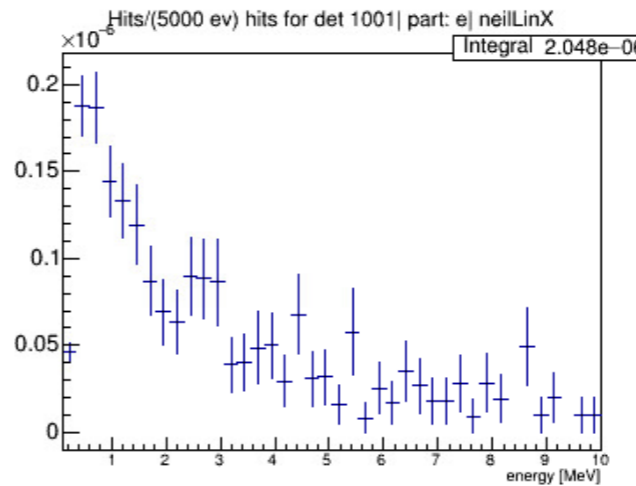
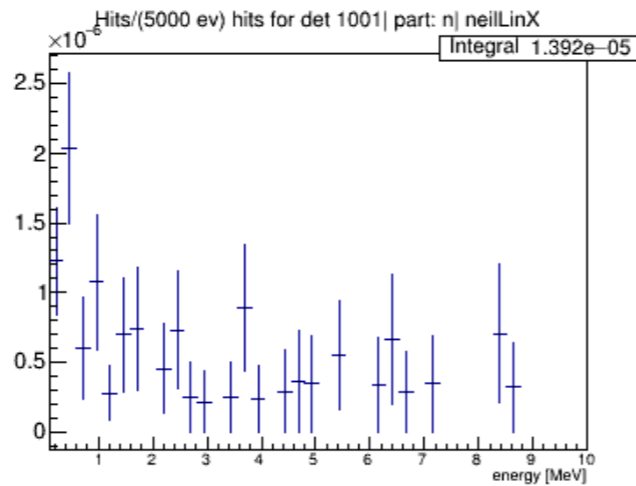
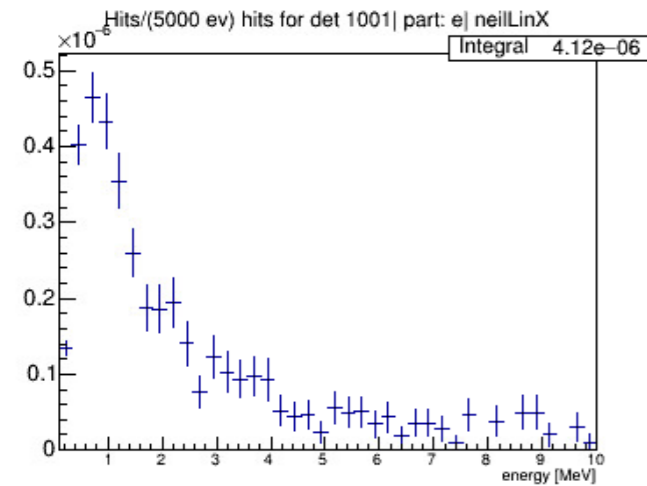
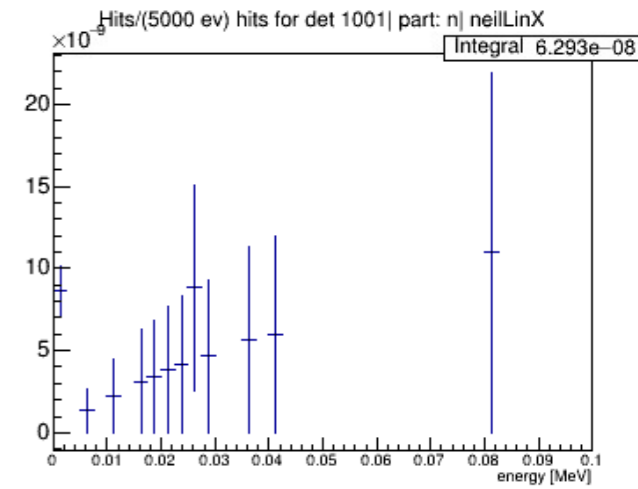
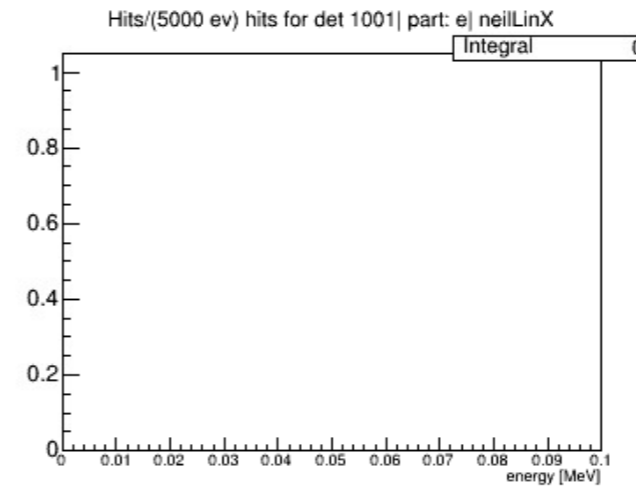
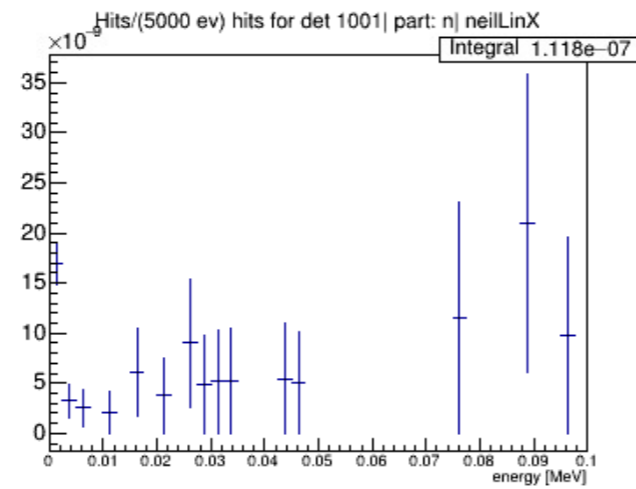
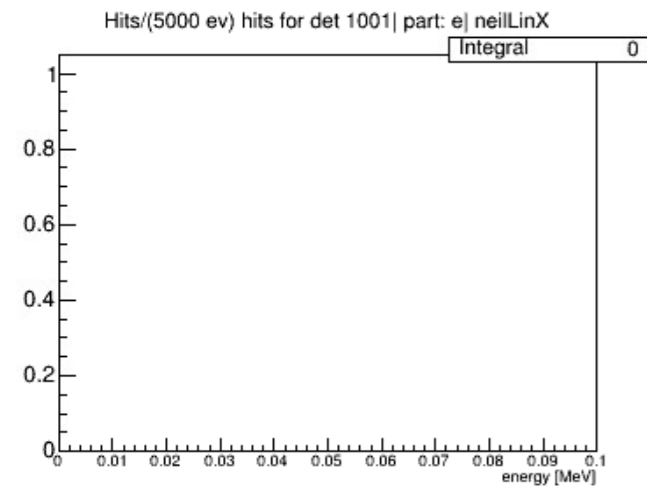


current setup + 4 in Donut+ 1 ft concrete shield



PREX2 - comparison

current setup

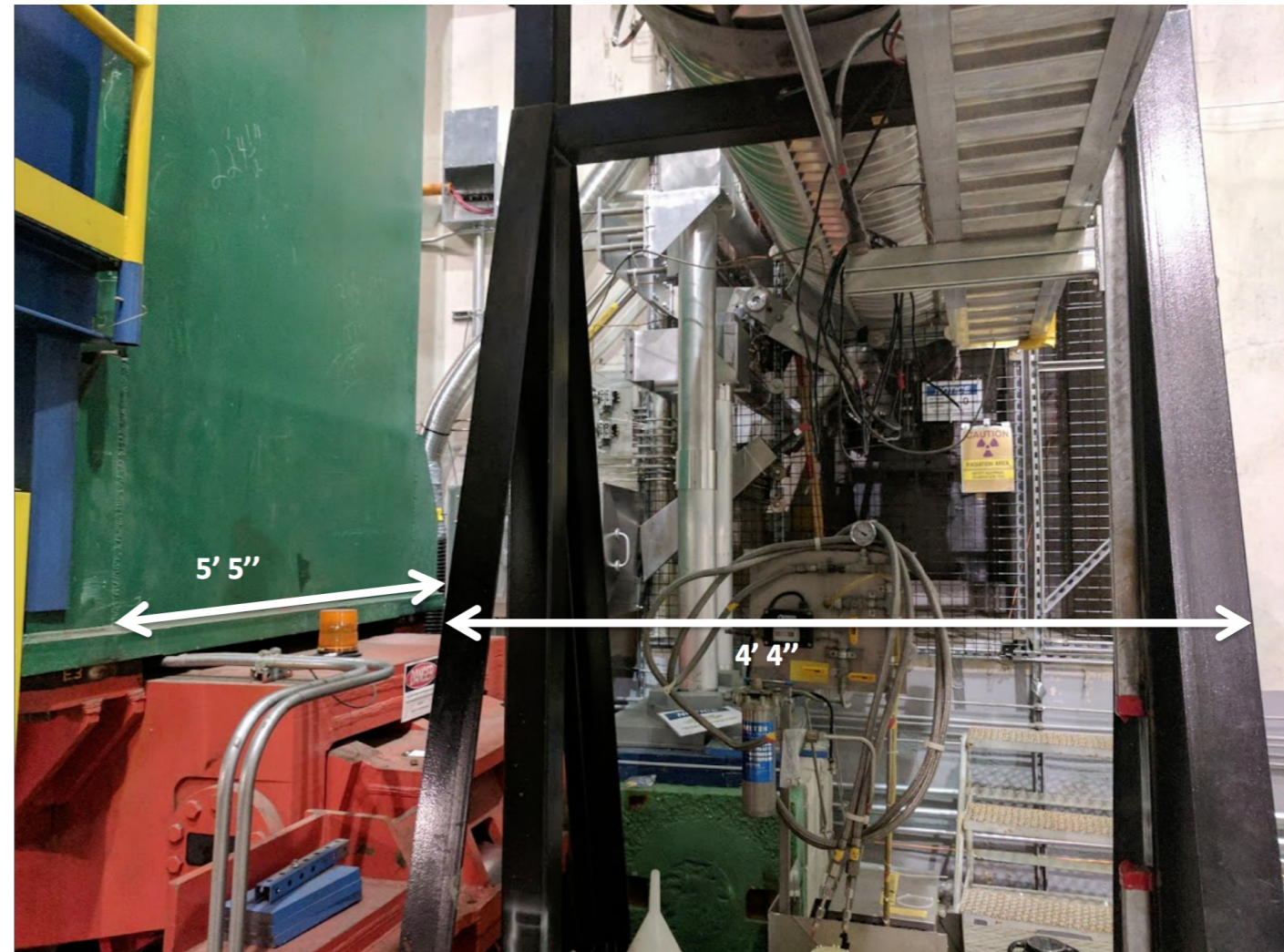
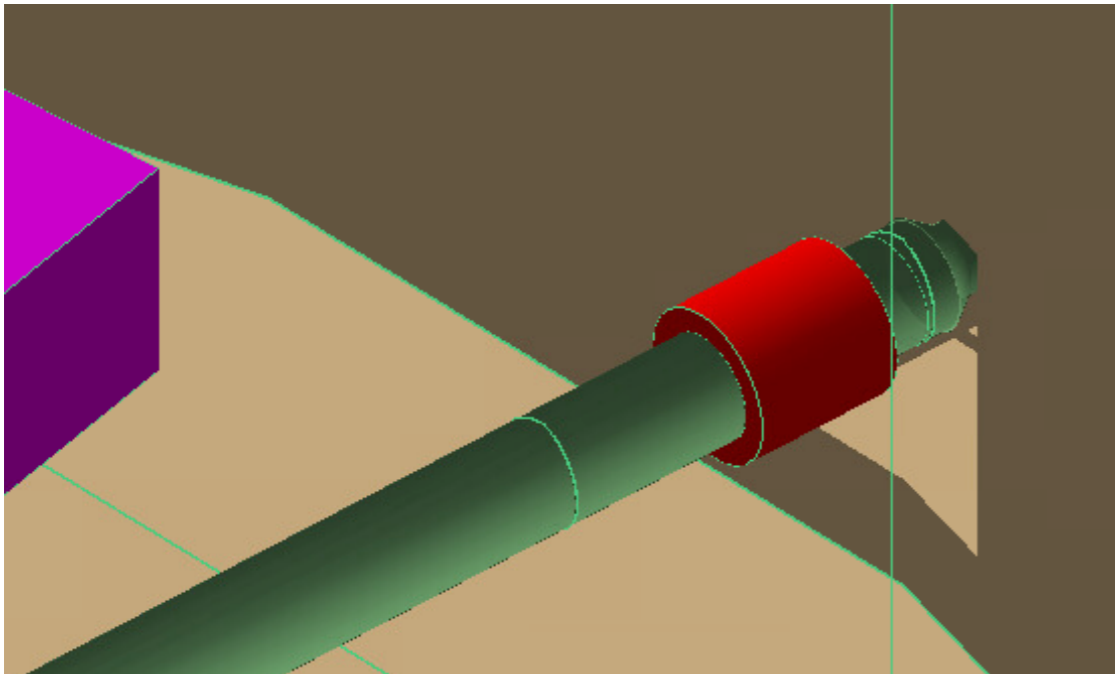


current setup + 4 in Donut+ 1 ft concrete shield

PREX2 - comparison

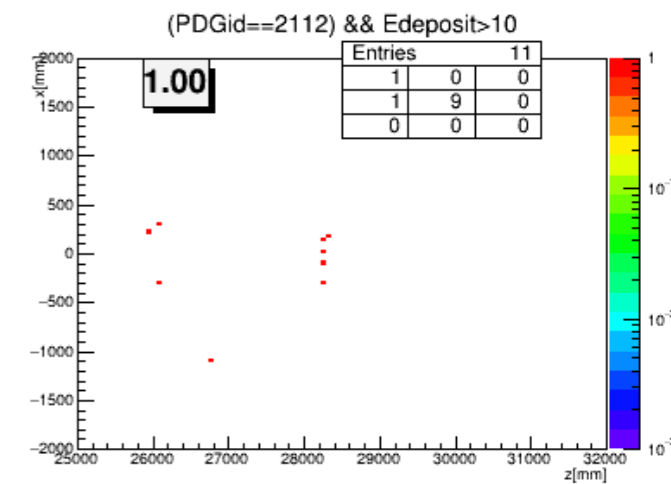
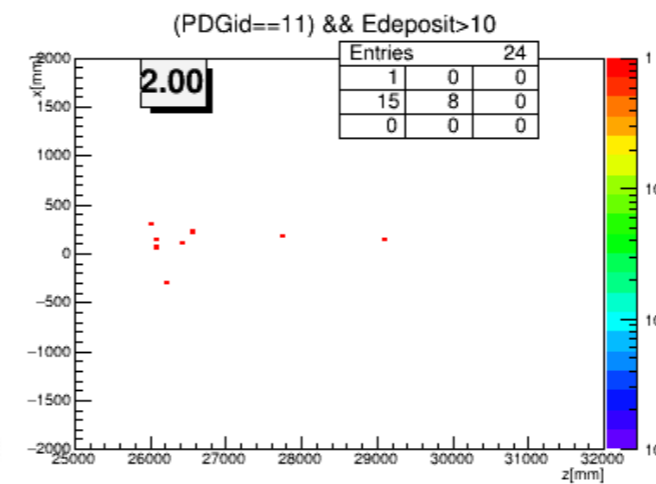
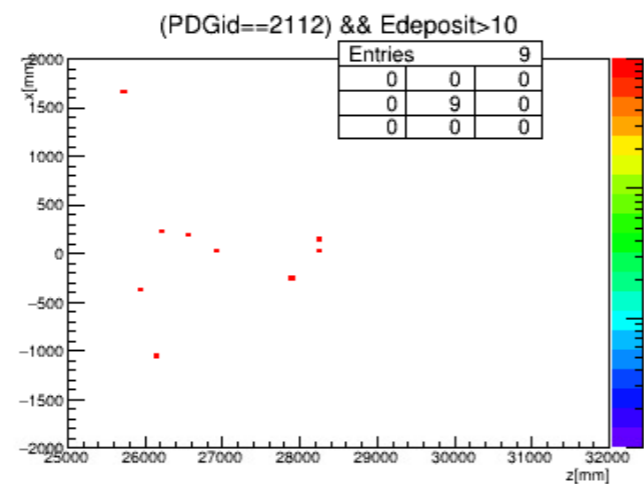
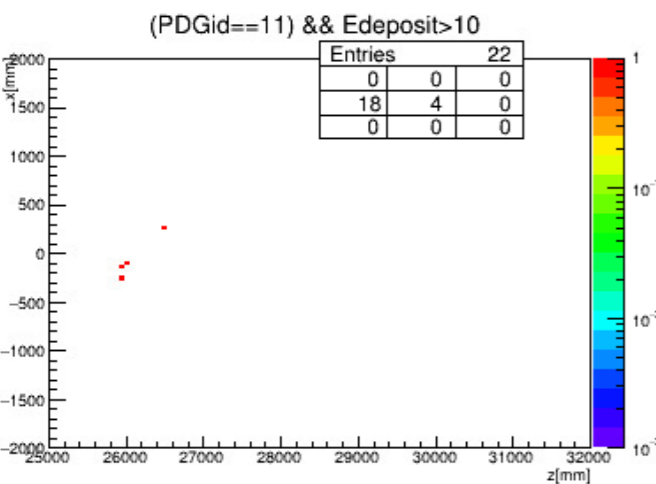
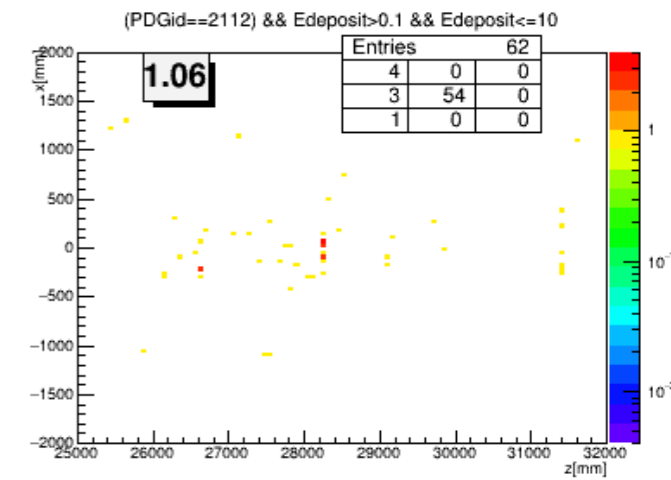
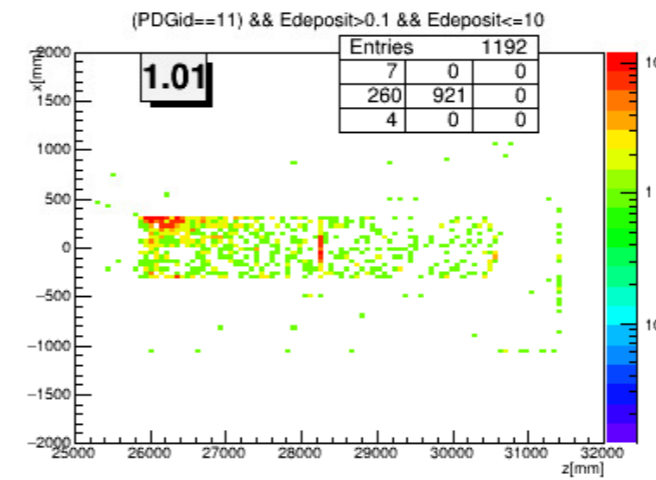
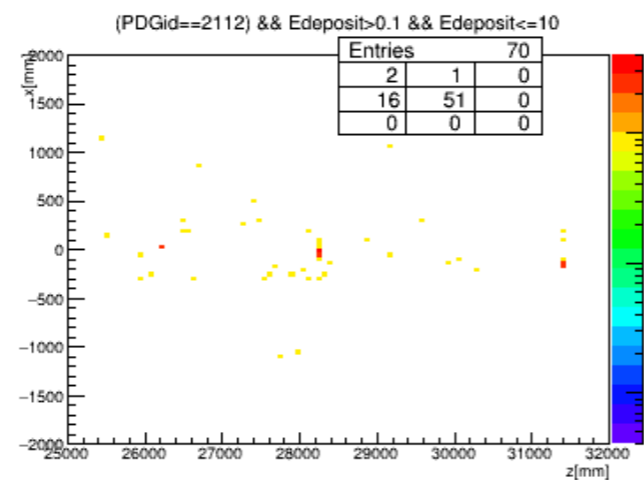
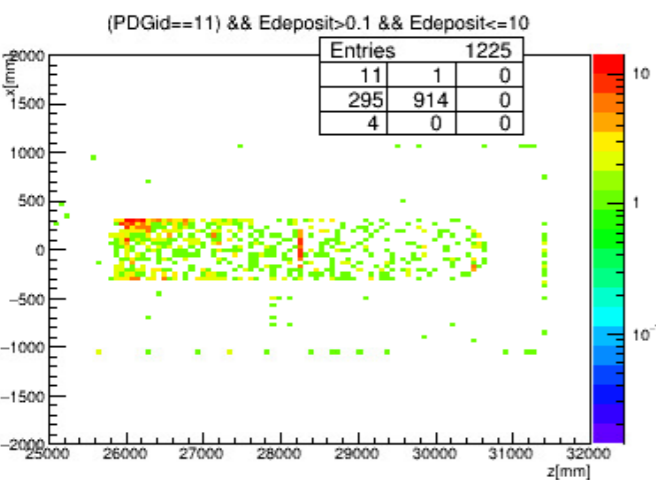
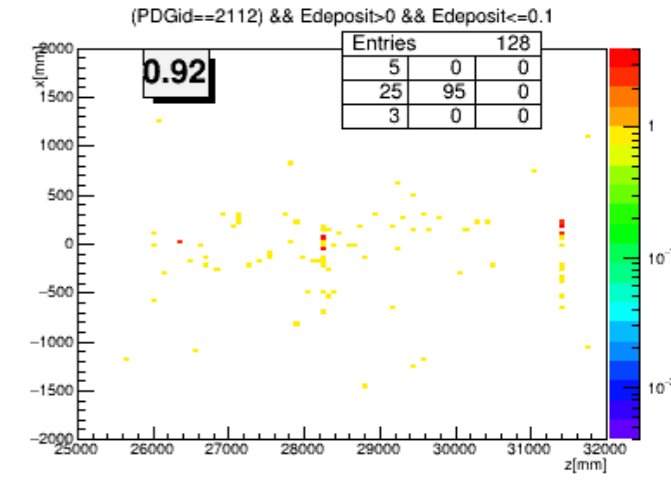
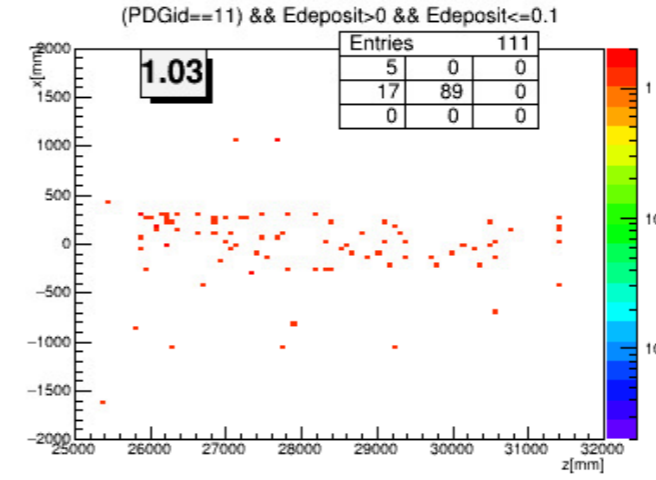
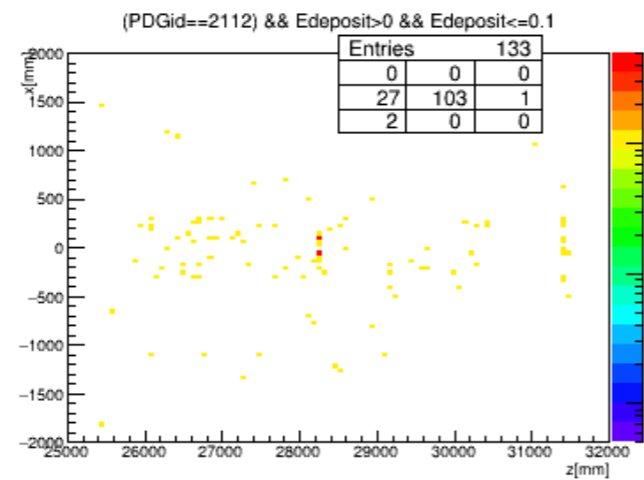
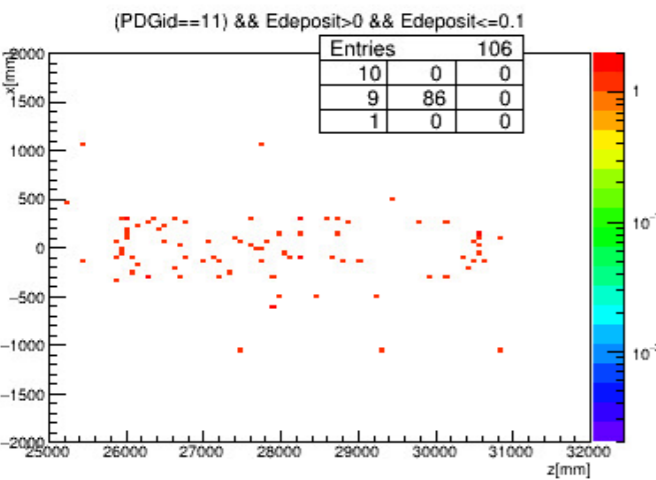
current setup + donut shield:

- * 131 cm in z
- * 20 cm in r (46 to 66 cm)
- * DS edge ~50 cm from the edge of the hall (would require some refinement to fit in)



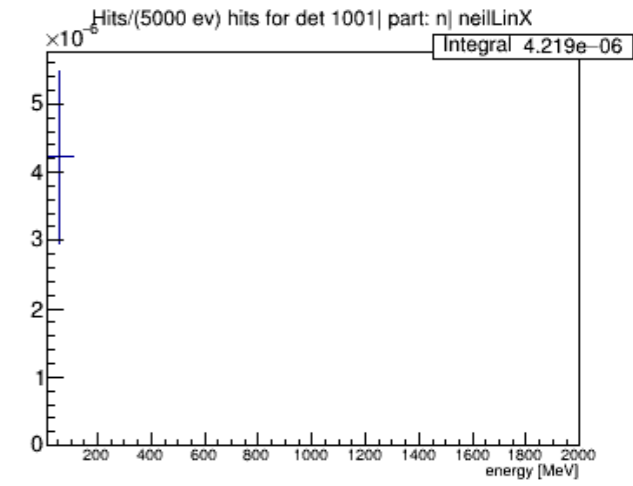
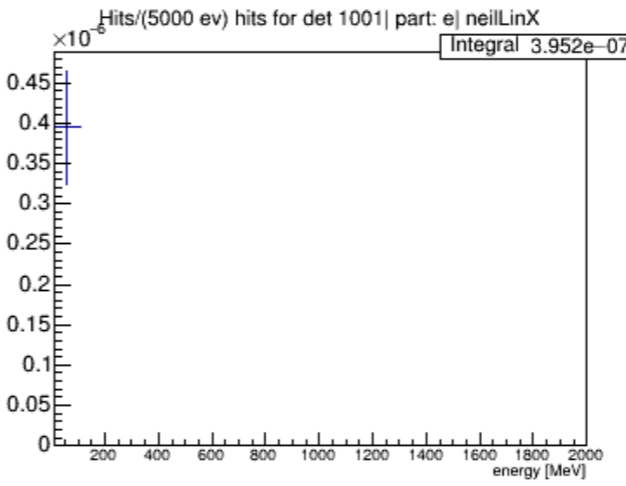
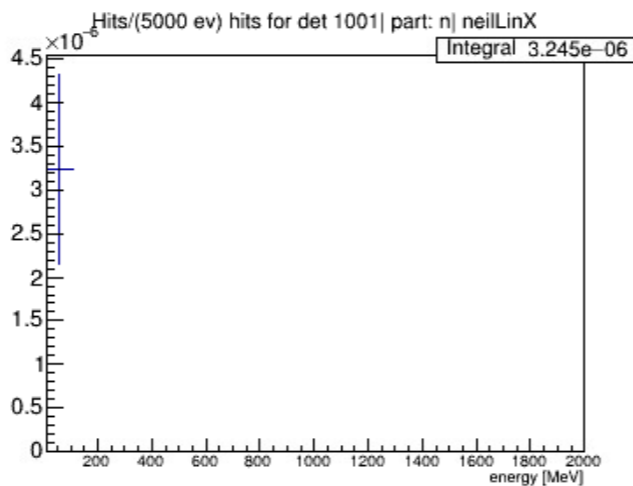
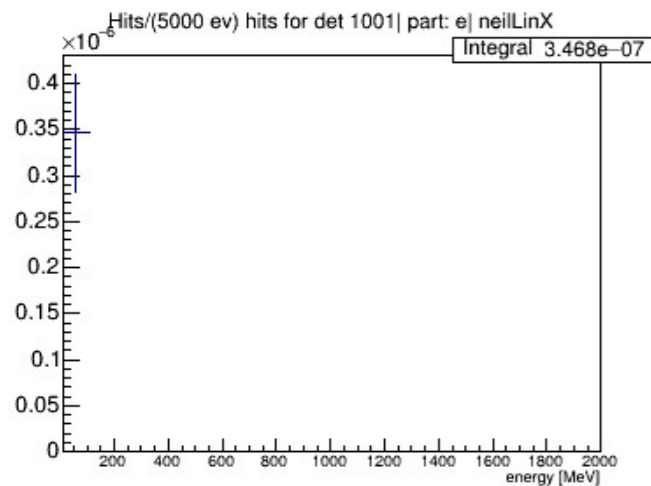
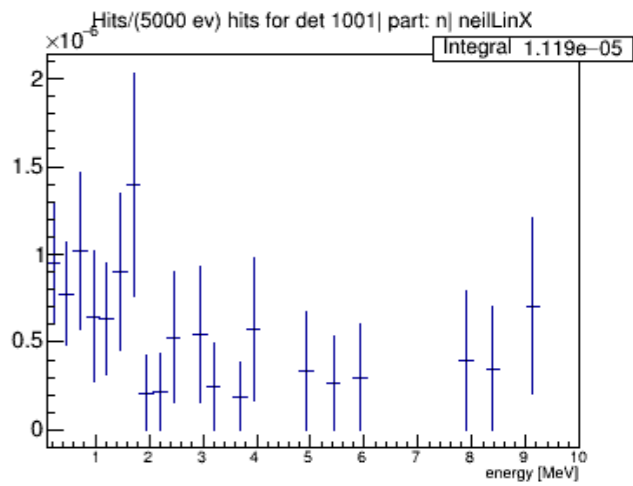
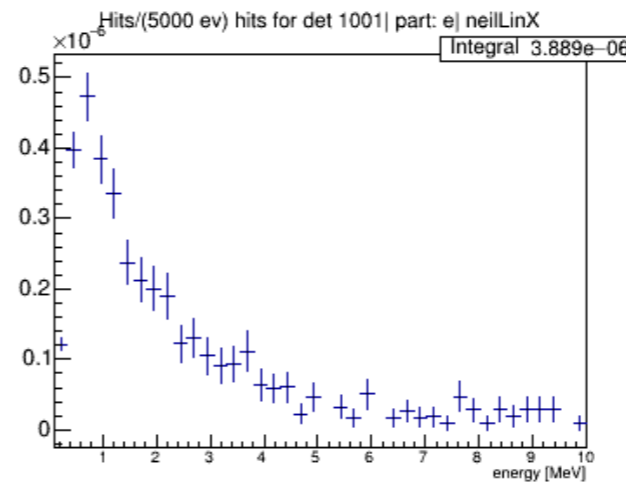
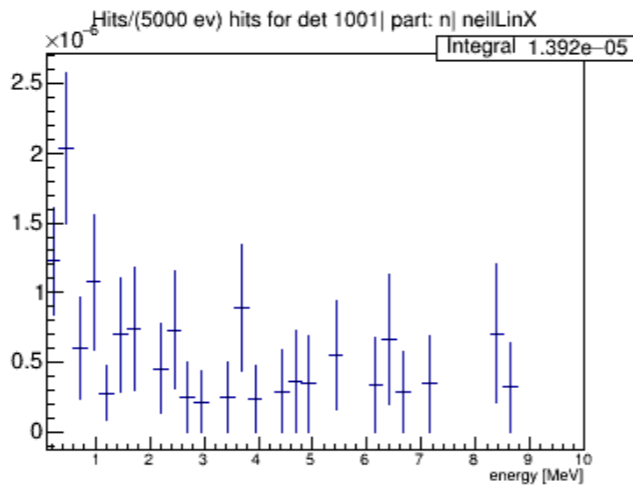
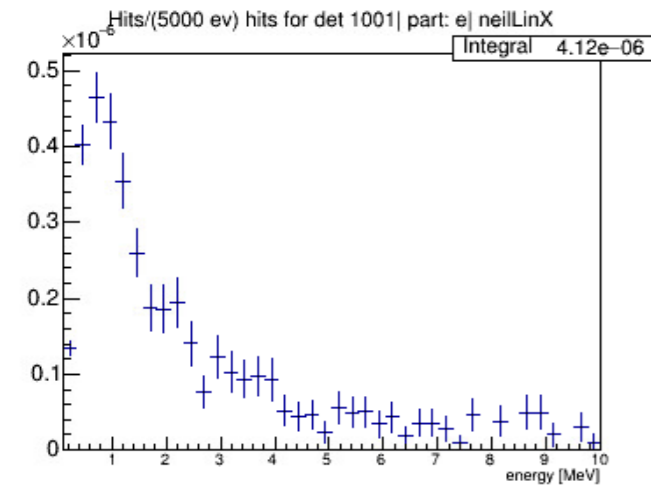
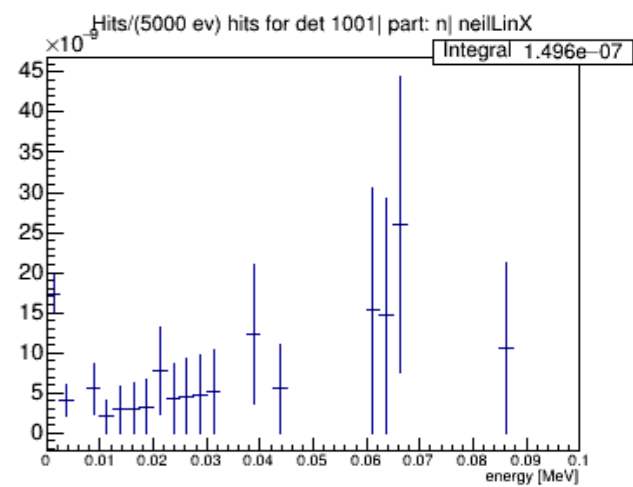
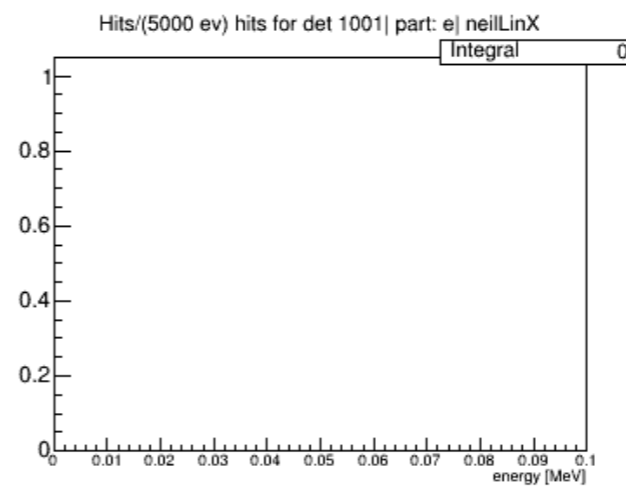
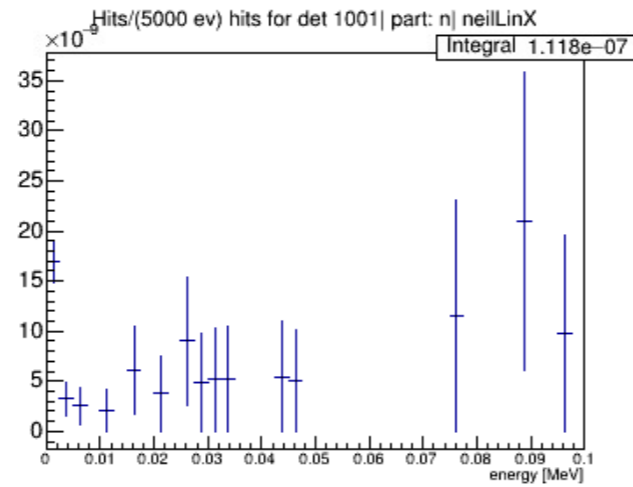
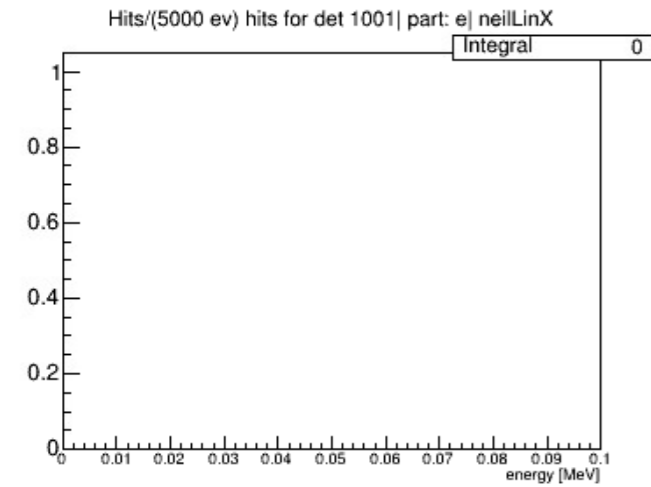
PREX2 - comparison

current setup



PREX2 - comparison

current setup

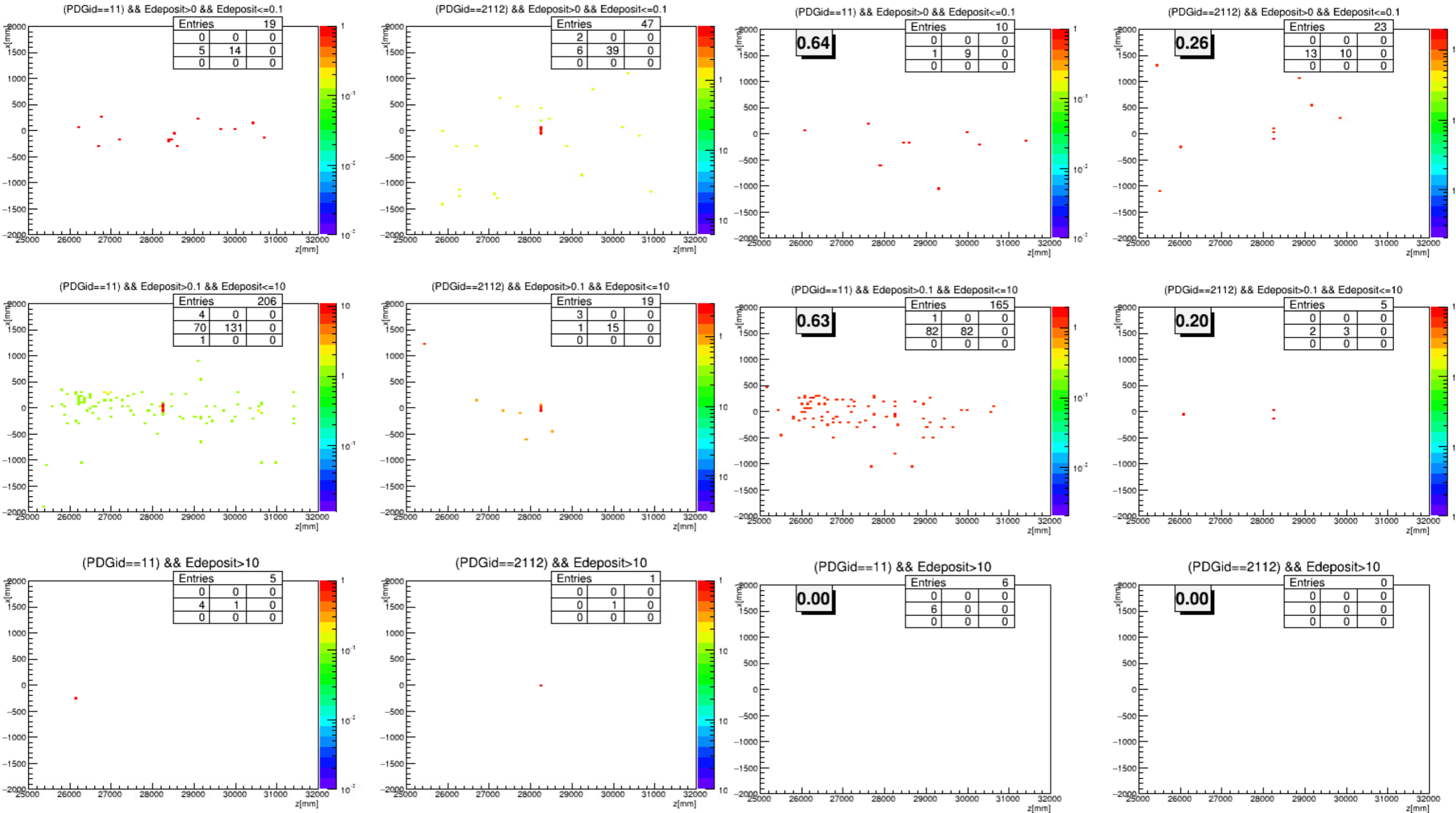


current setup + donut shield

CREX - comparison

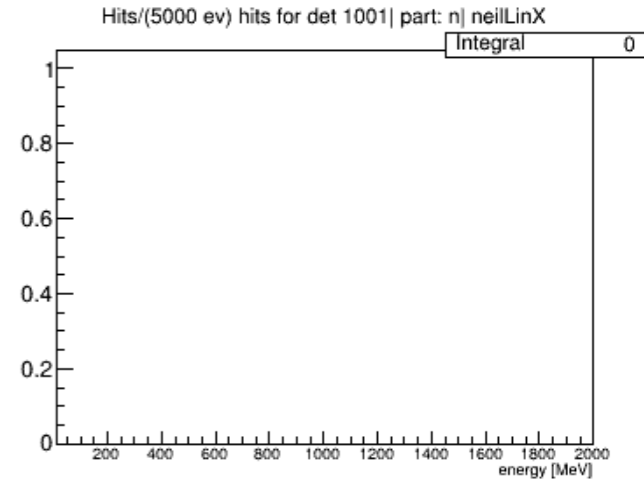
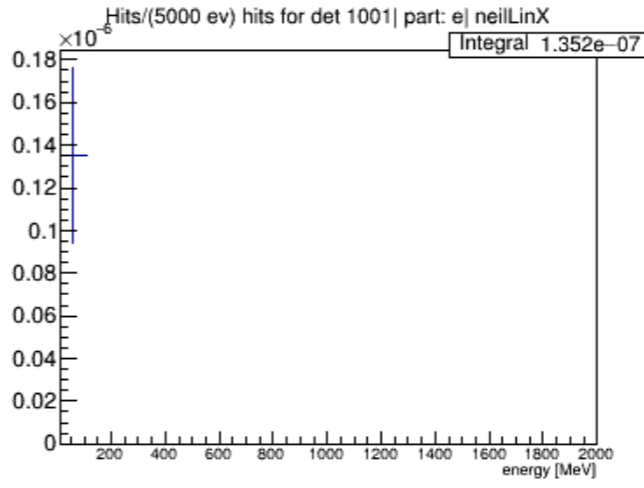
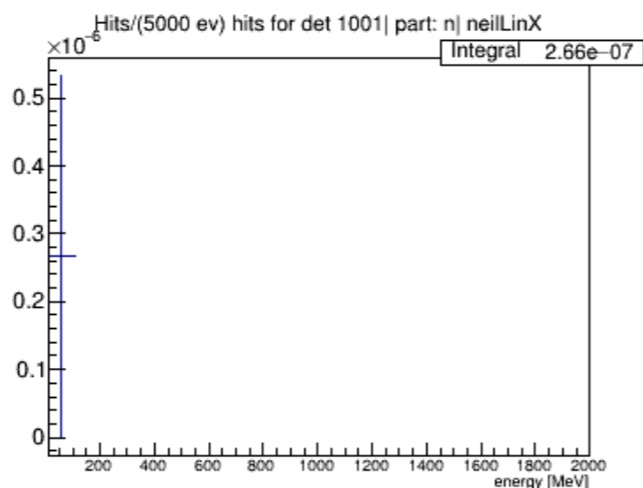
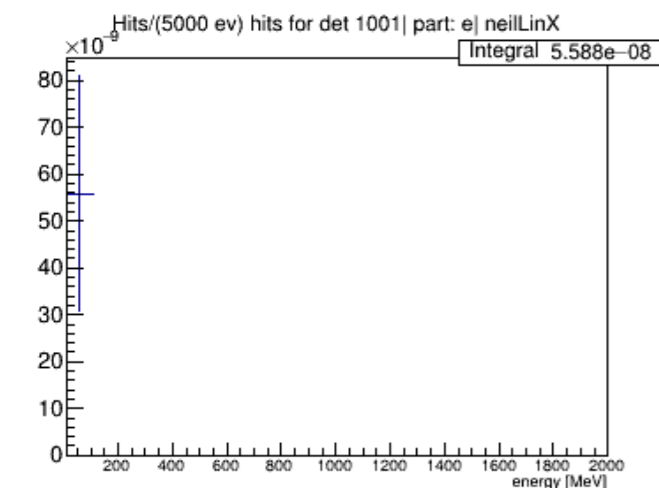
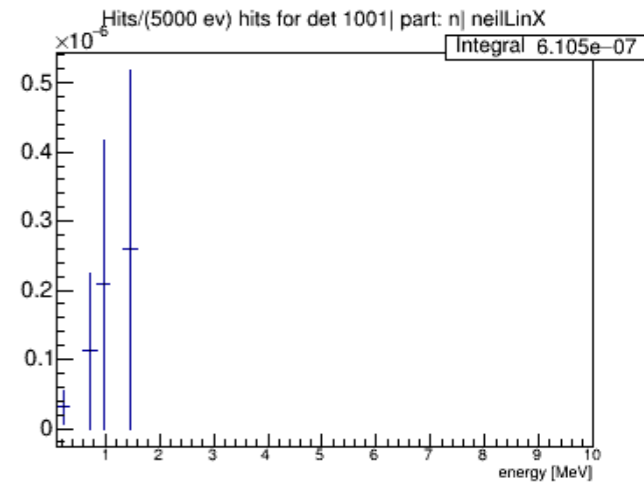
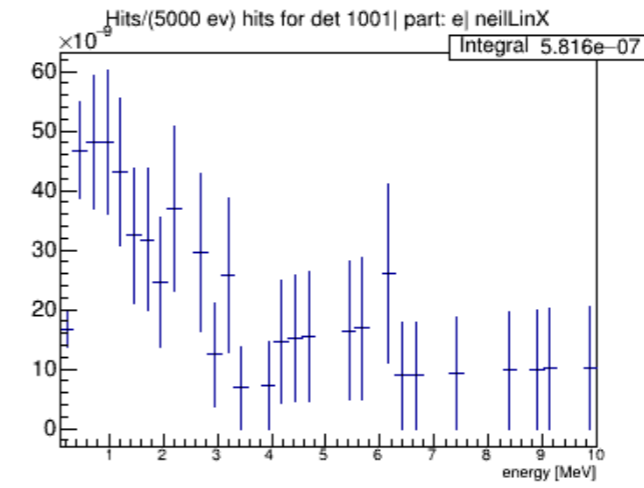
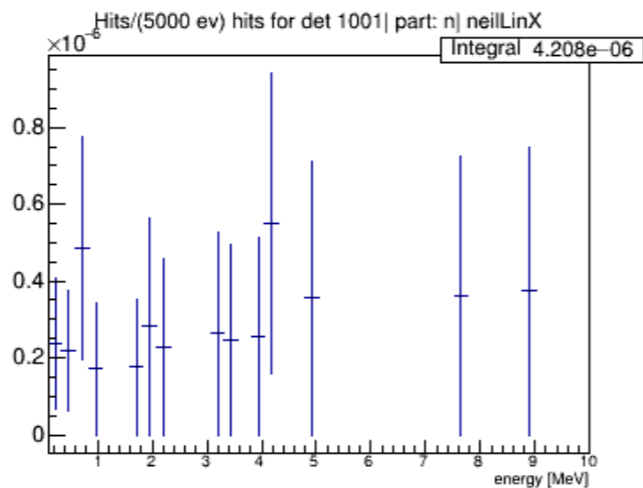
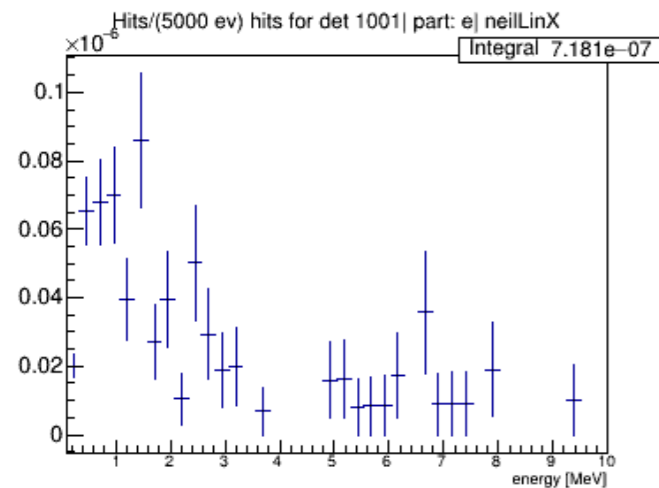
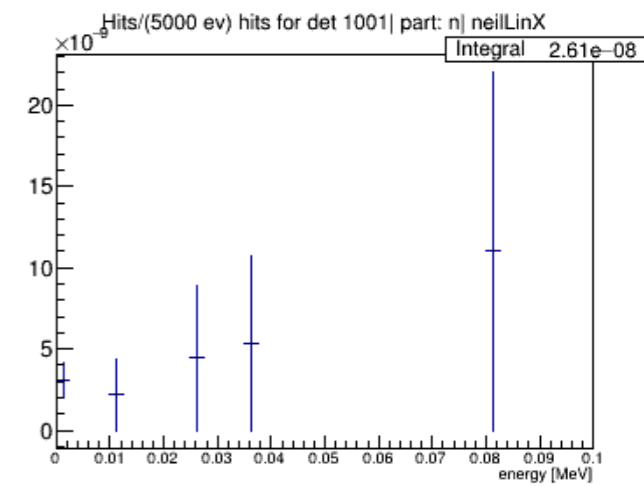
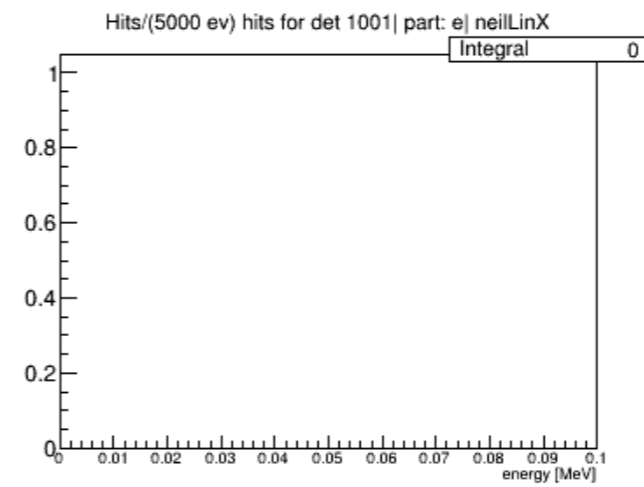
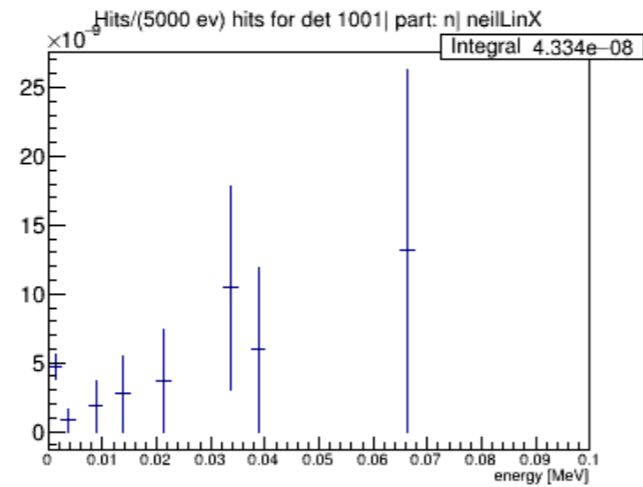
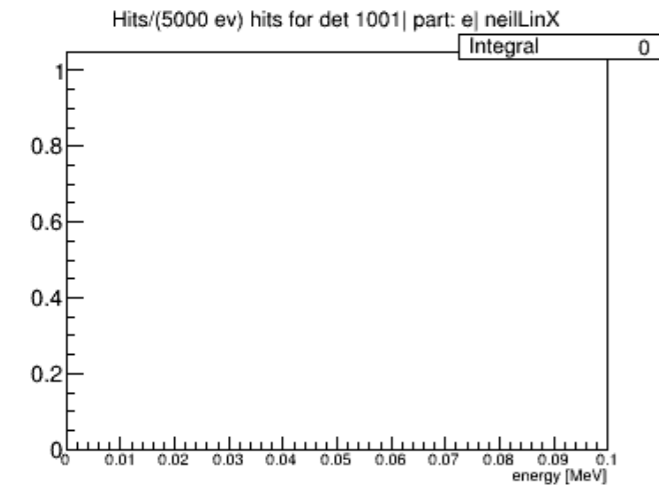
current setup

current setup + 4 in donut



CREX - comparison

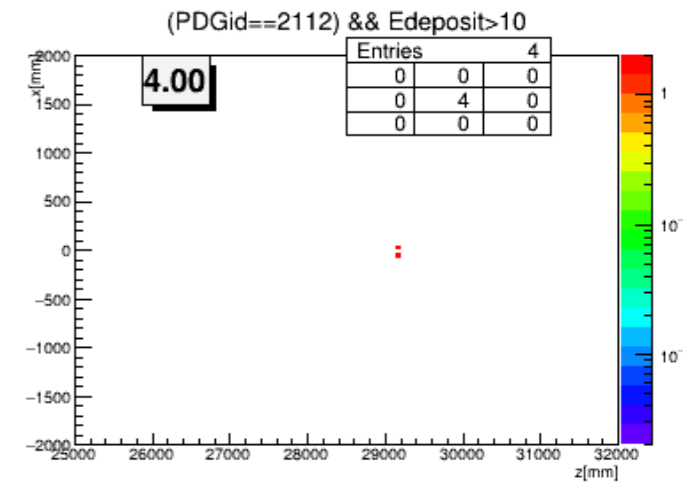
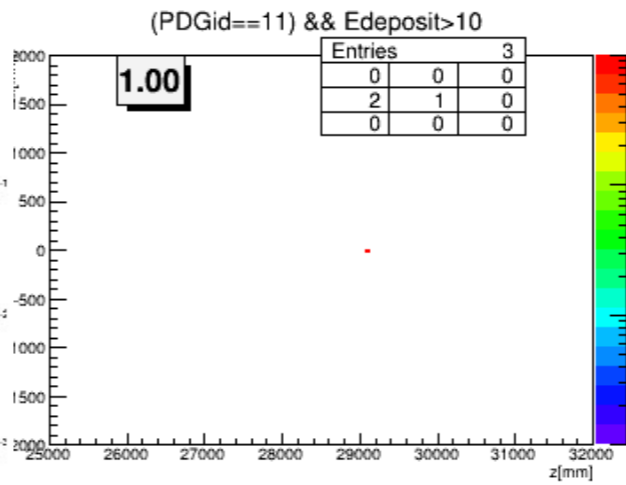
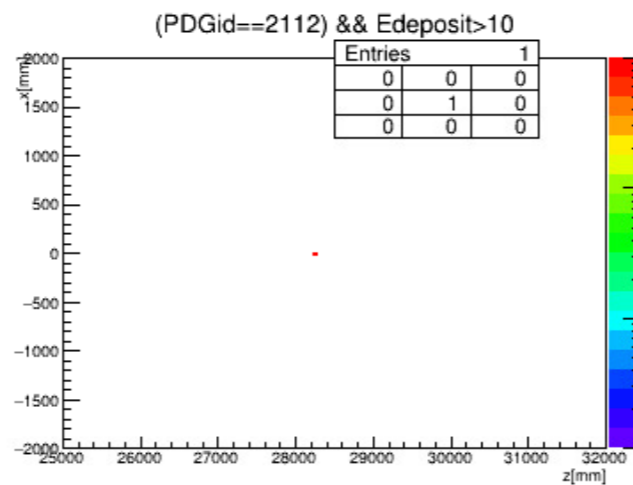
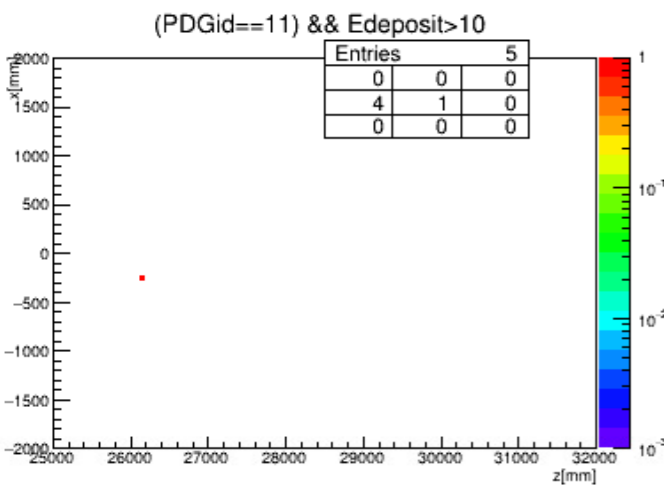
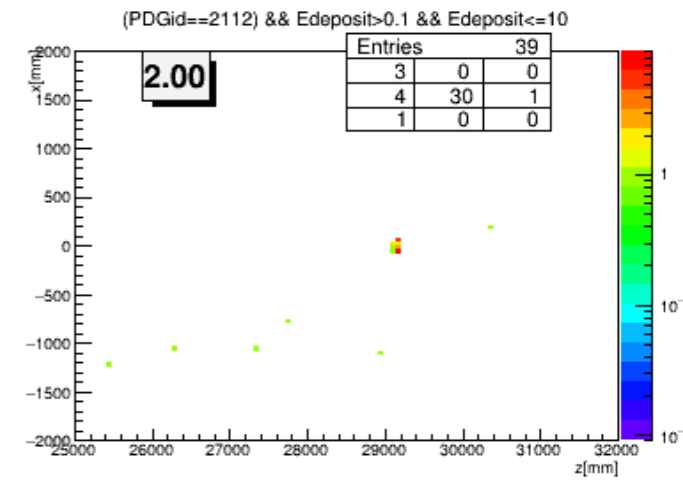
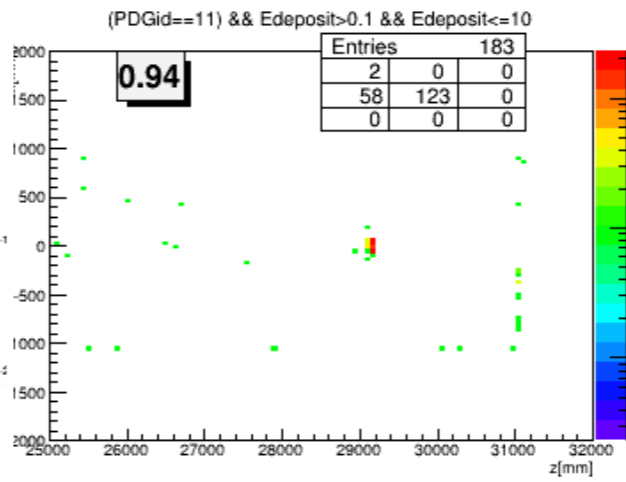
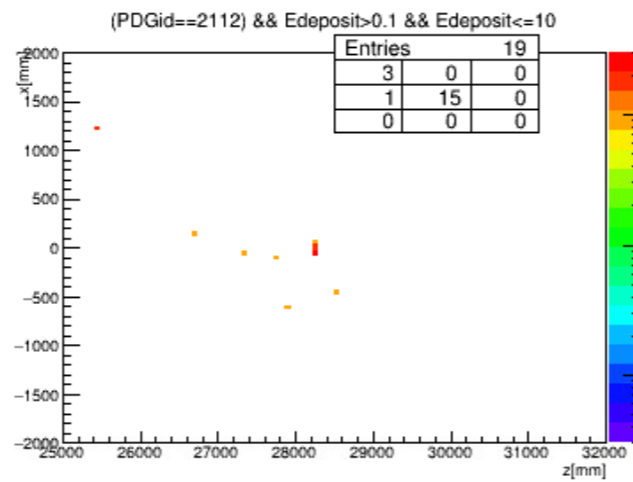
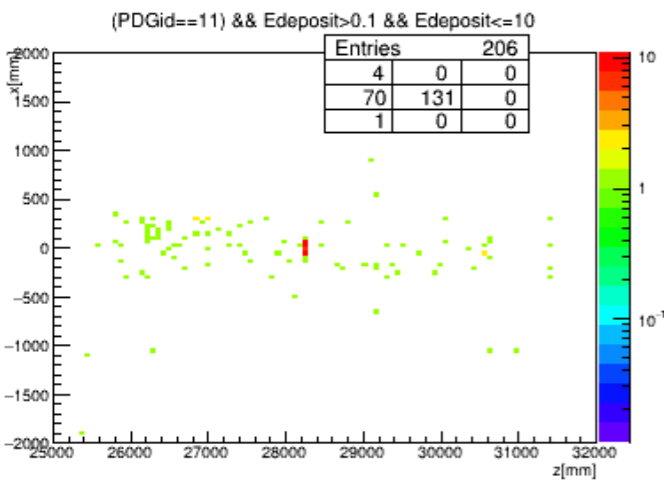
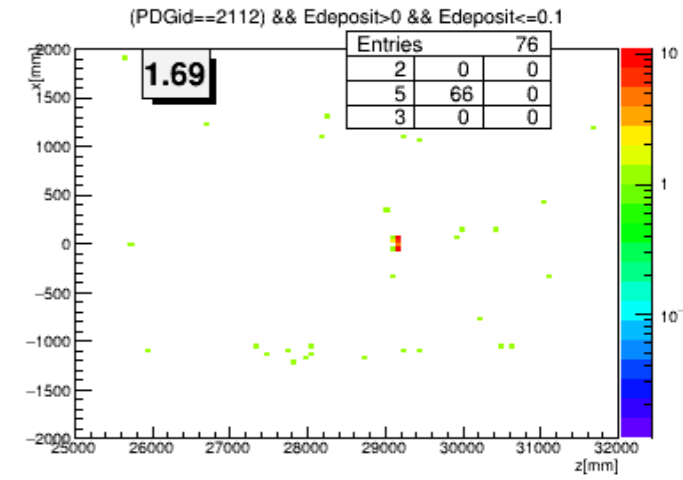
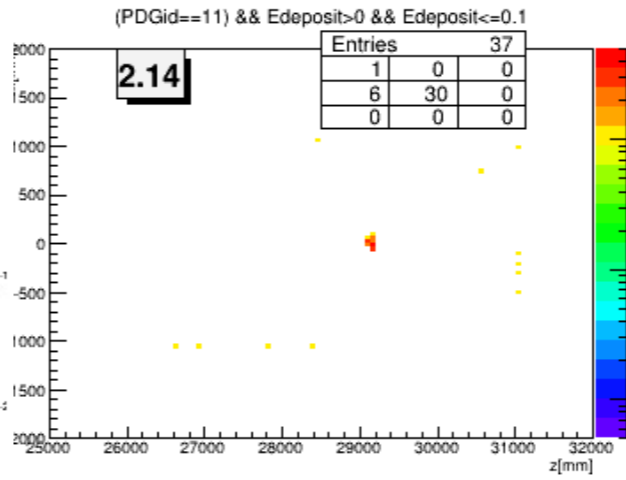
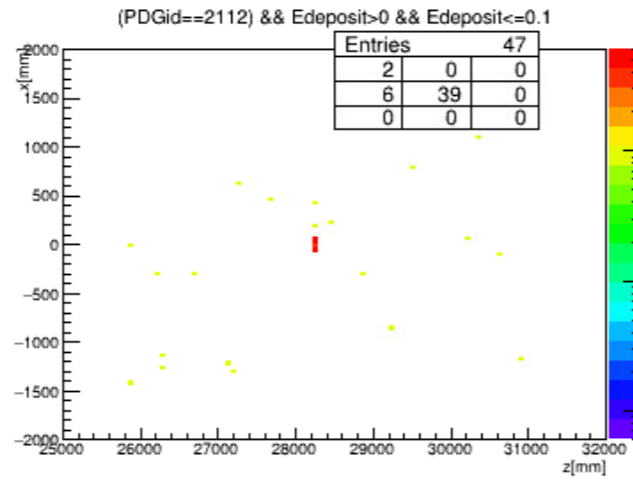
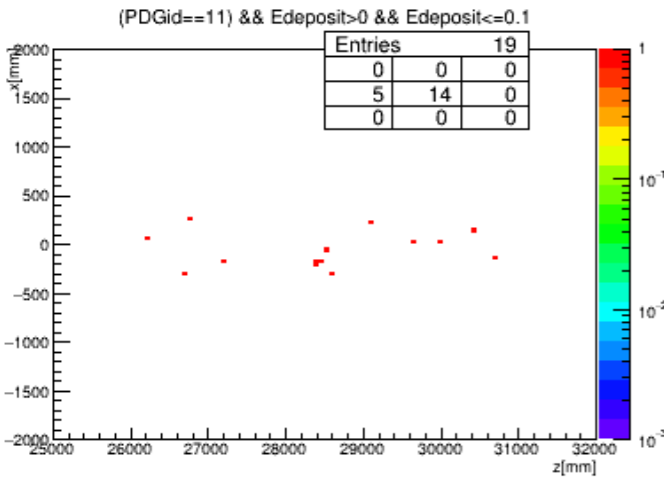
current setup



current setup + 4 in donut

CREX - comparison

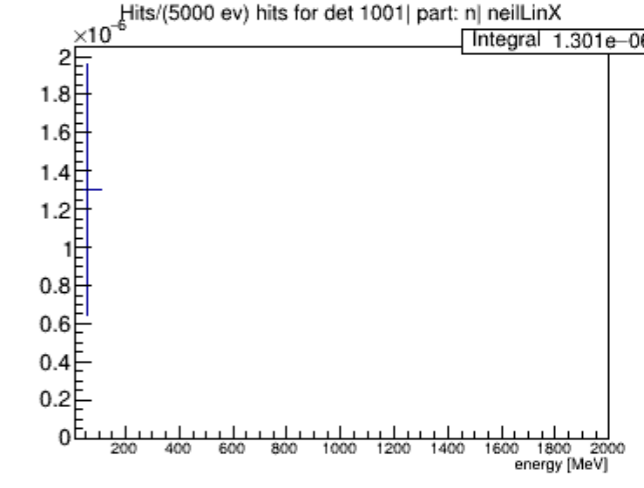
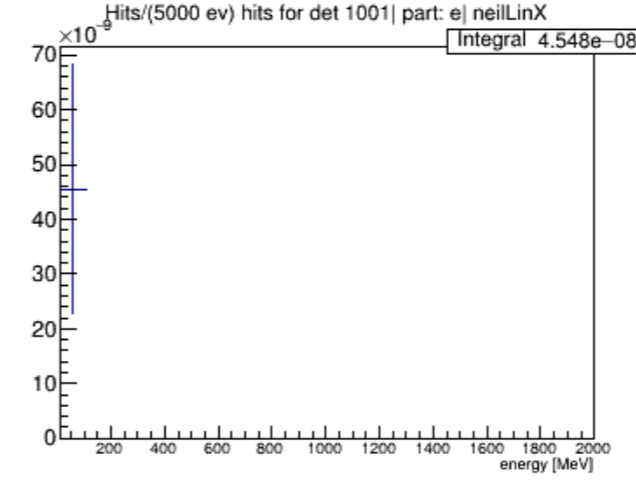
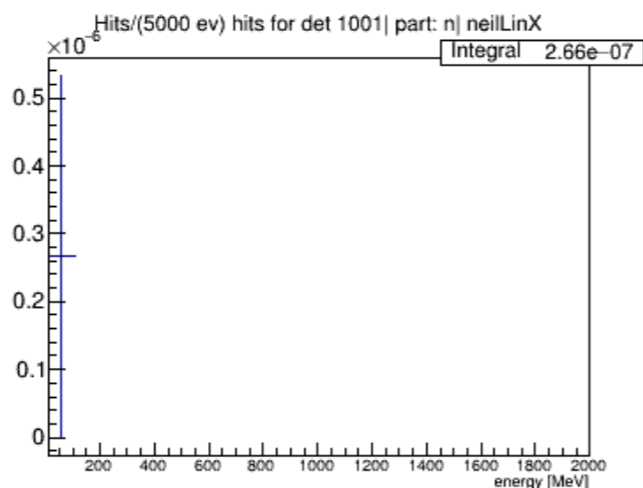
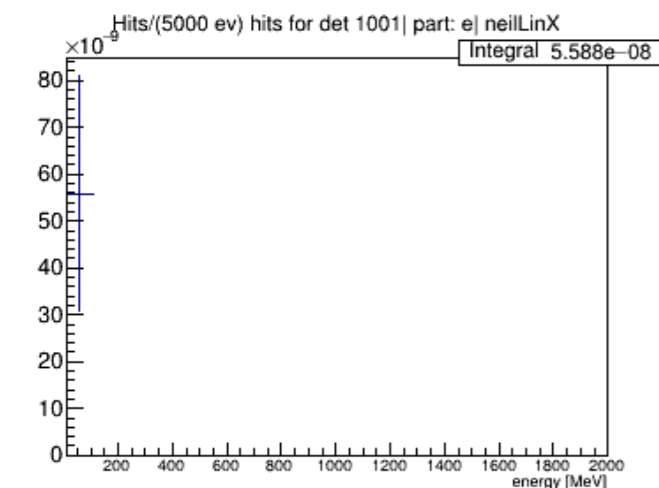
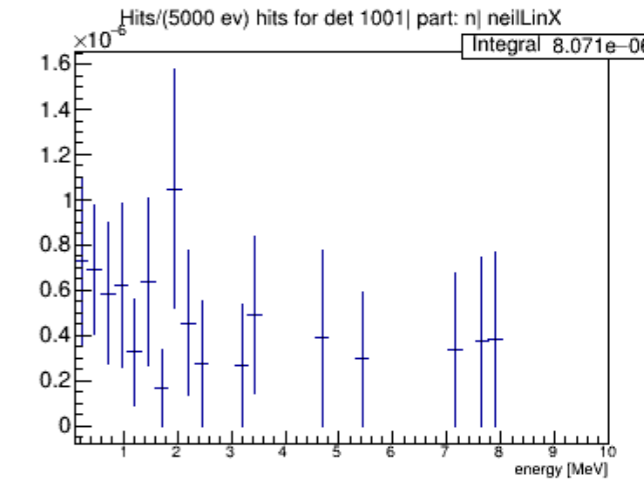
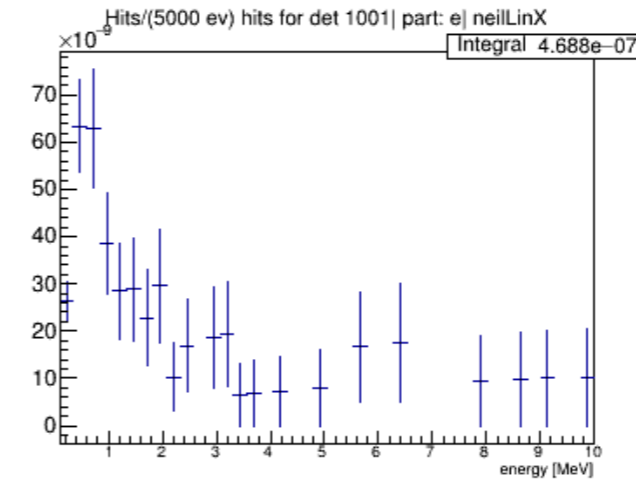
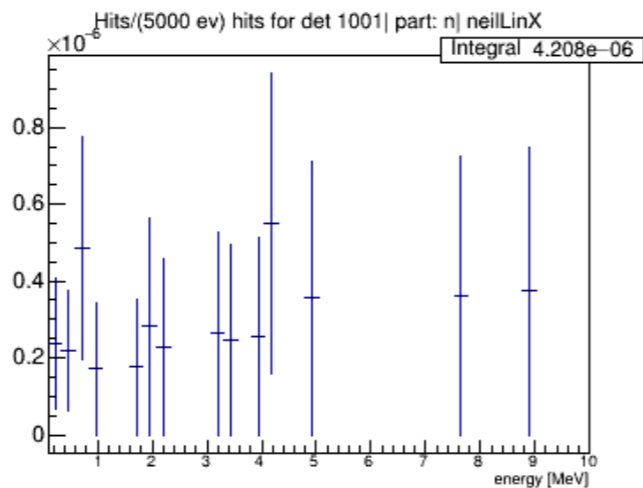
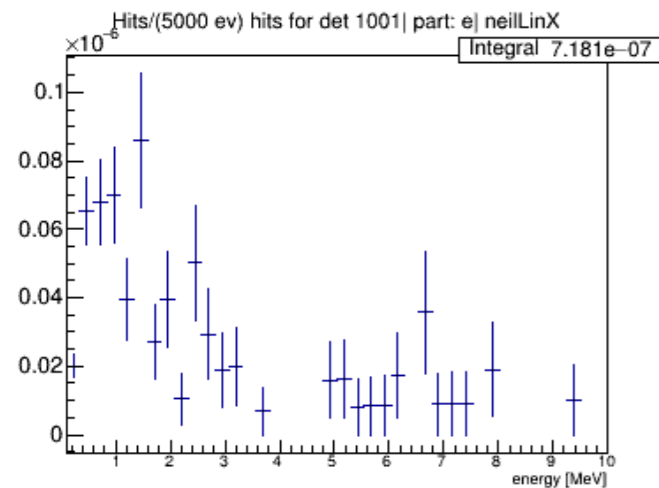
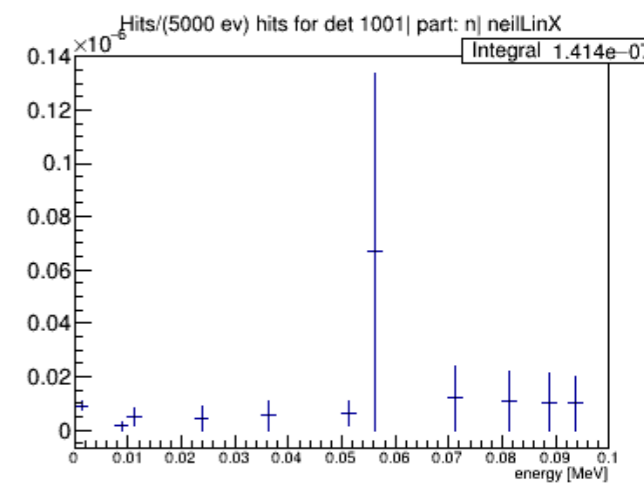
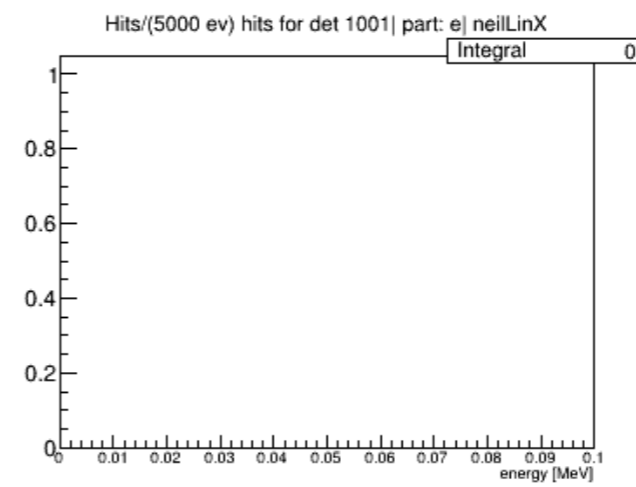
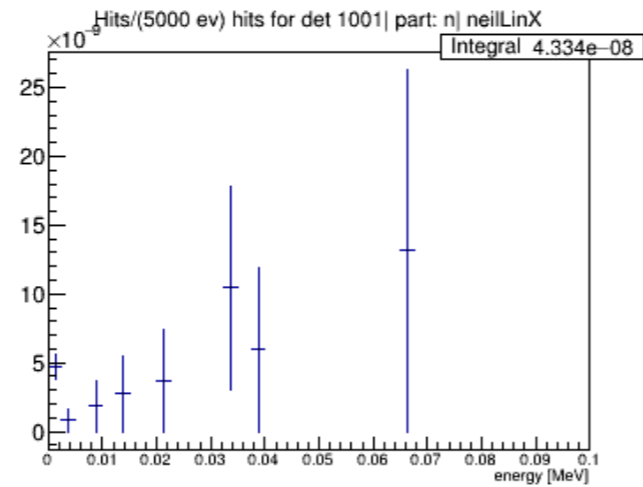
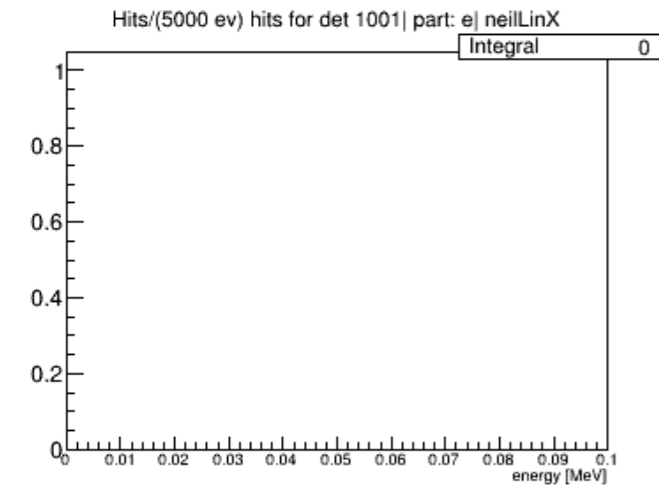
current setup



PREX1 dump setup

CREX - comparison

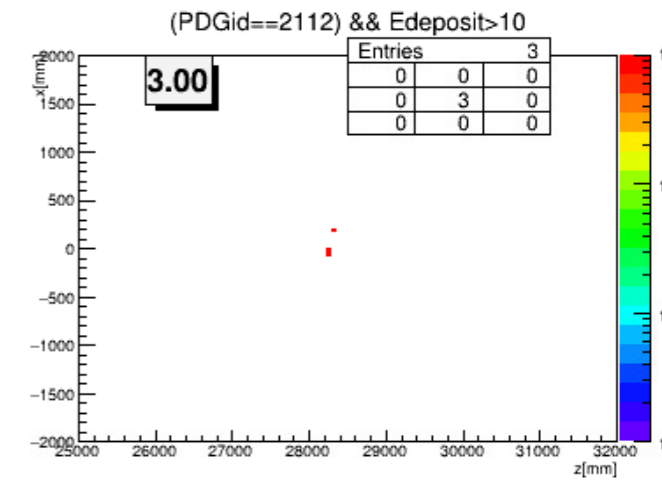
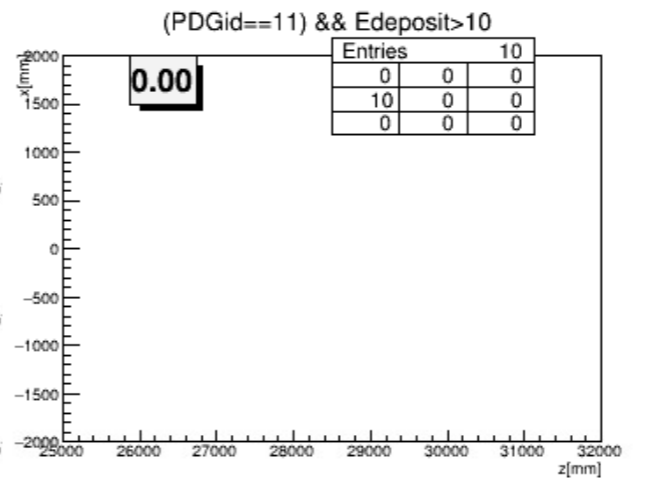
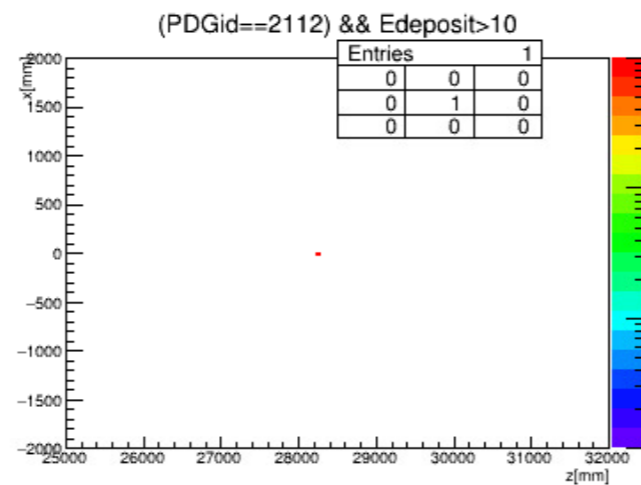
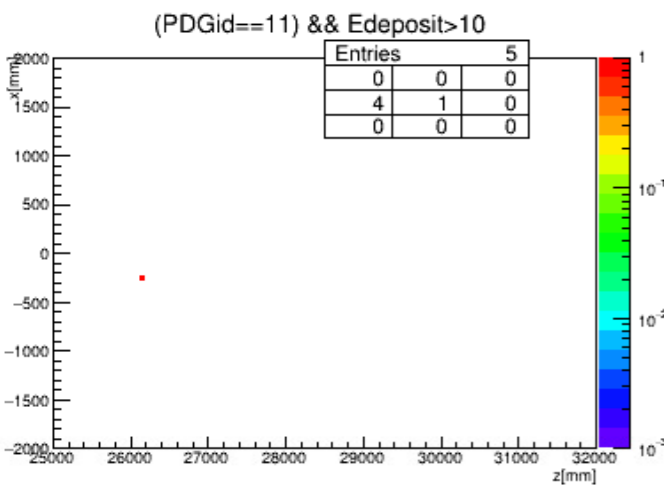
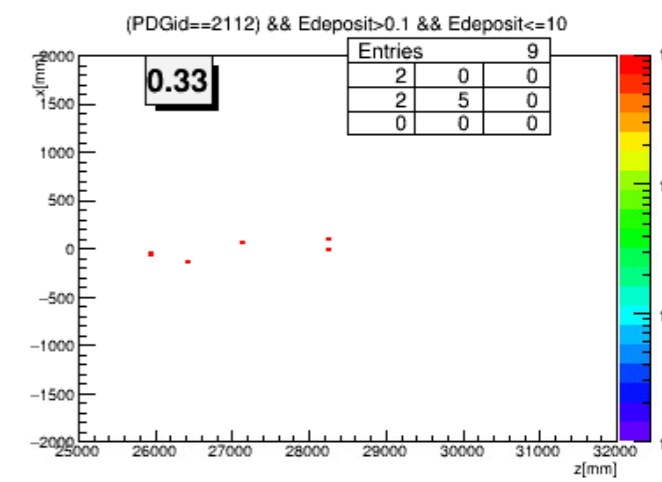
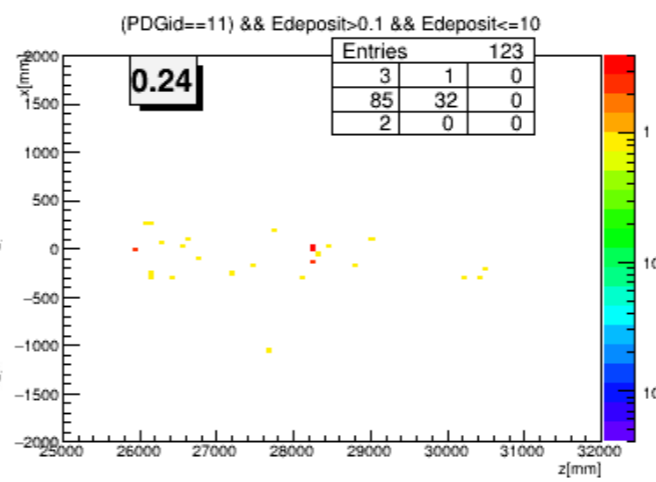
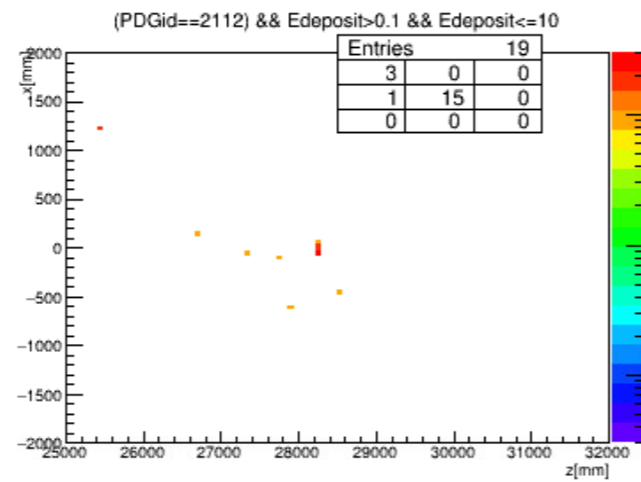
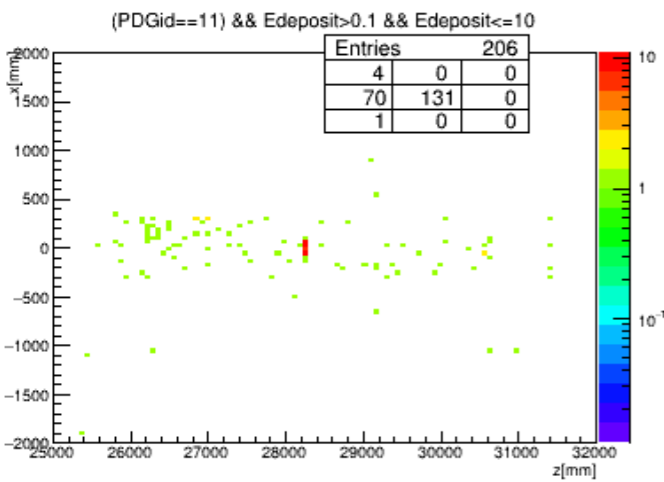
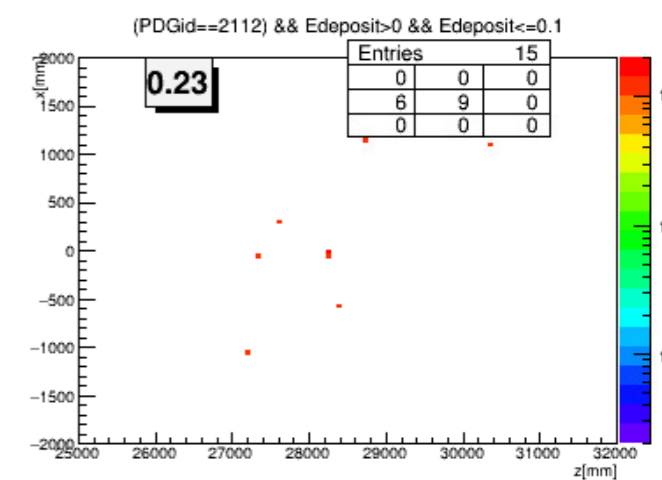
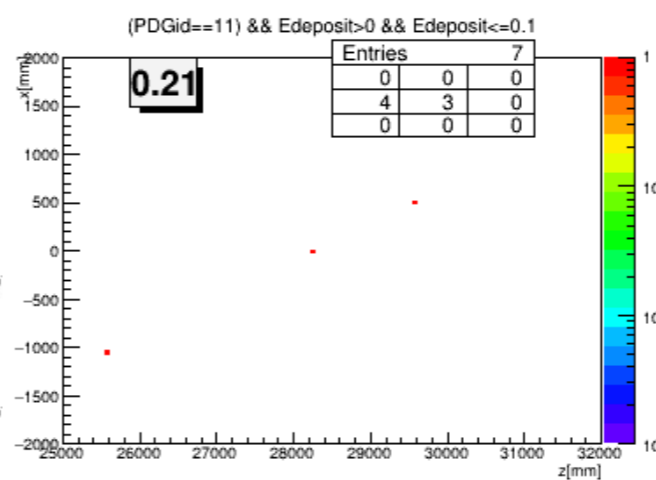
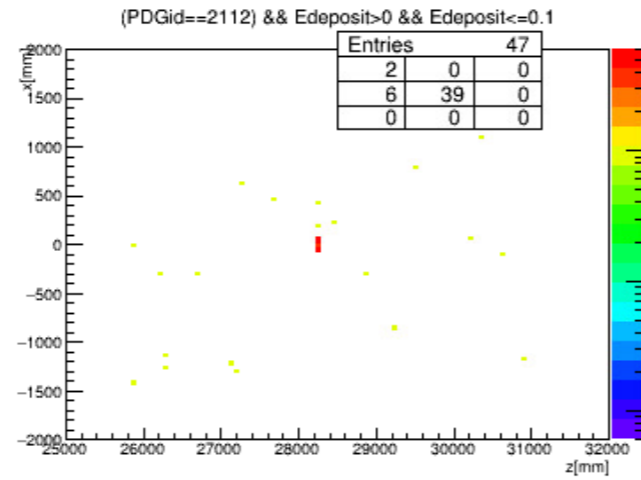
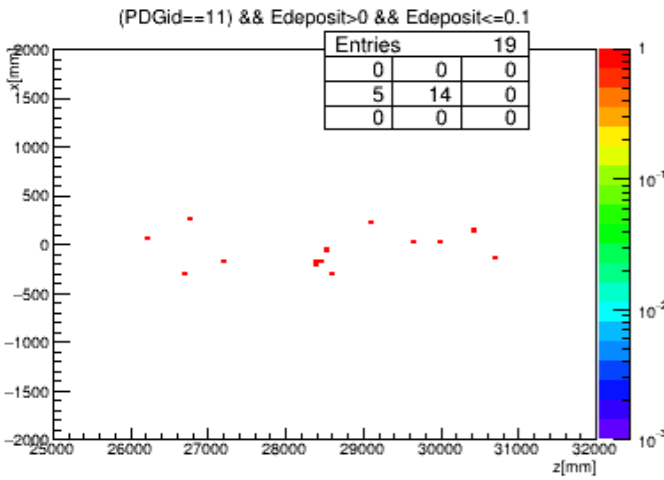
current setup



PREX1 dump setup

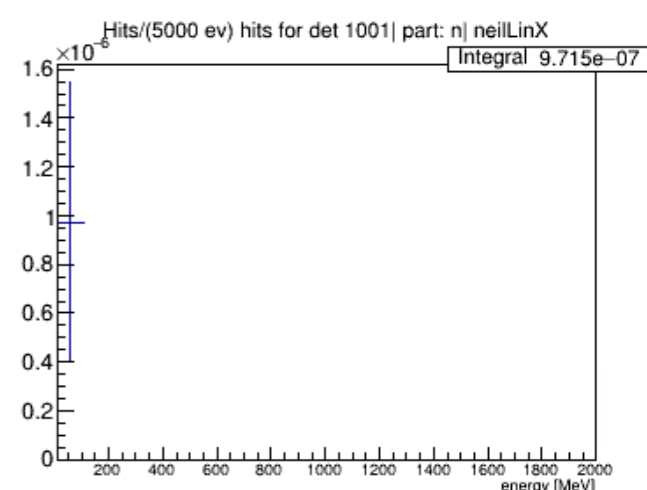
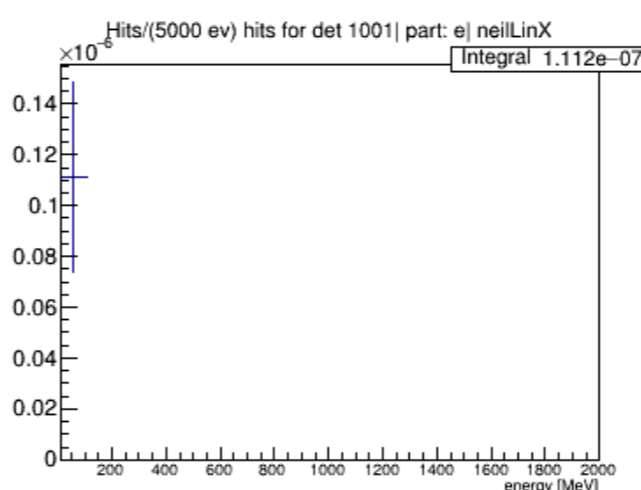
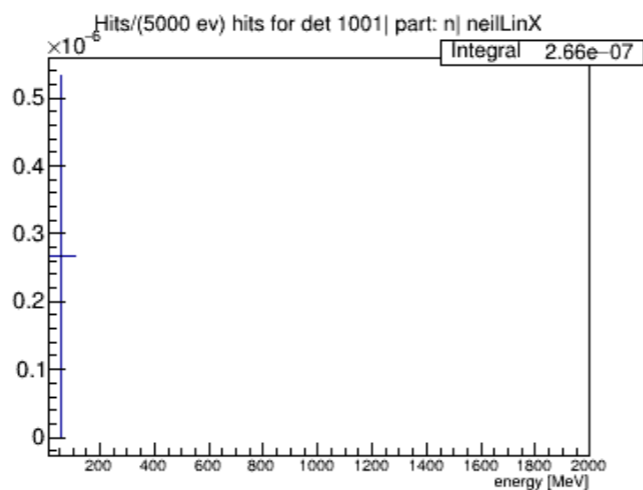
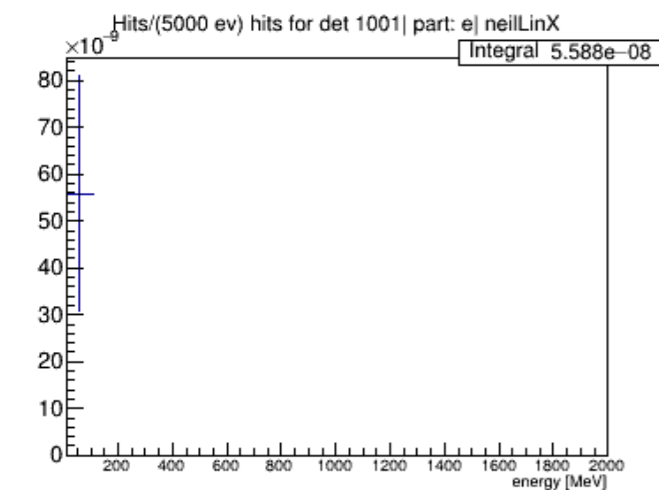
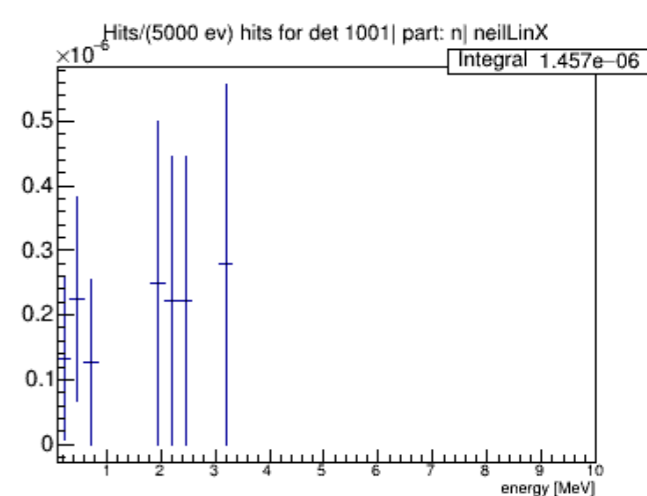
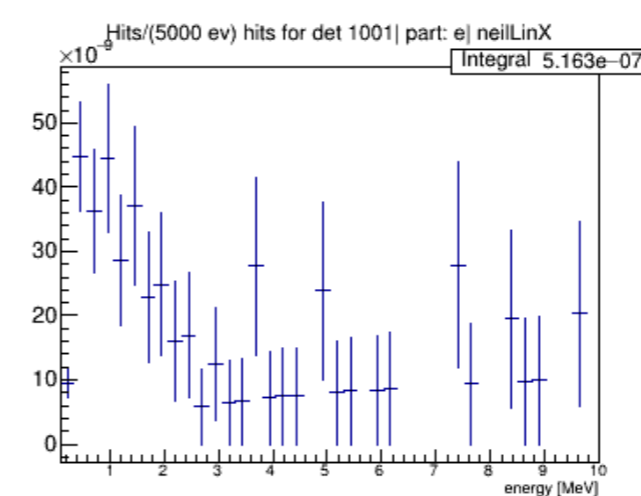
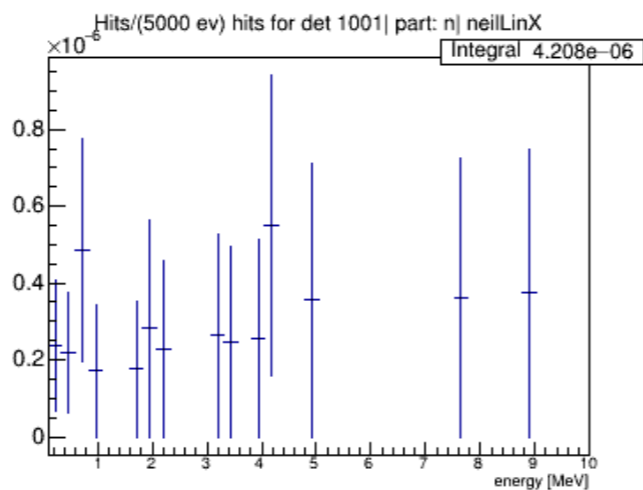
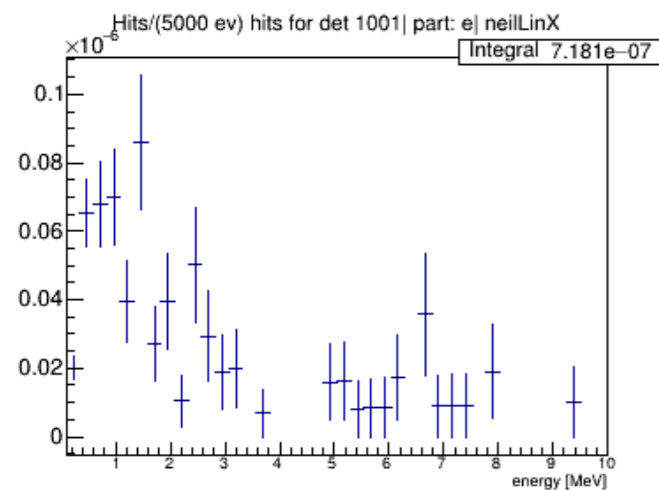
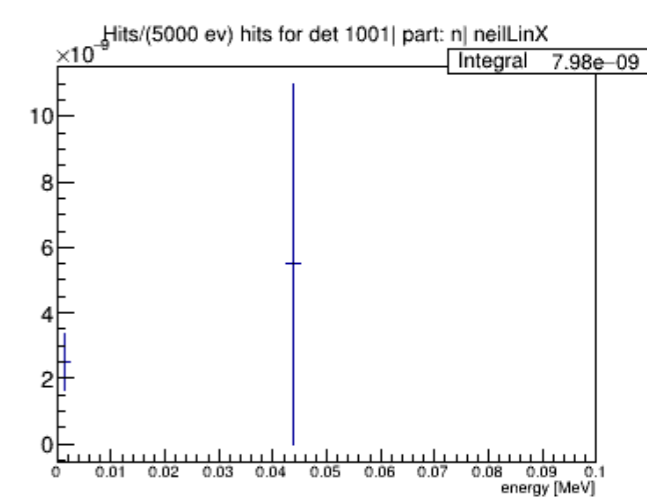
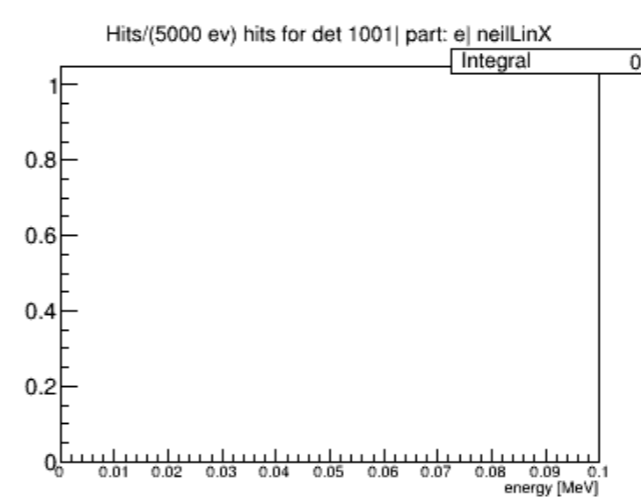
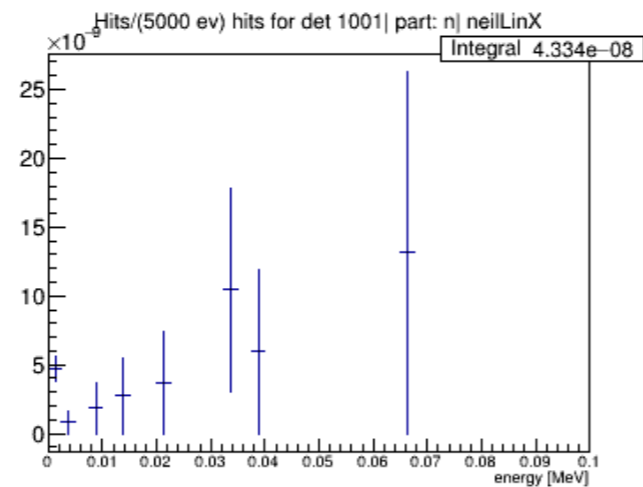
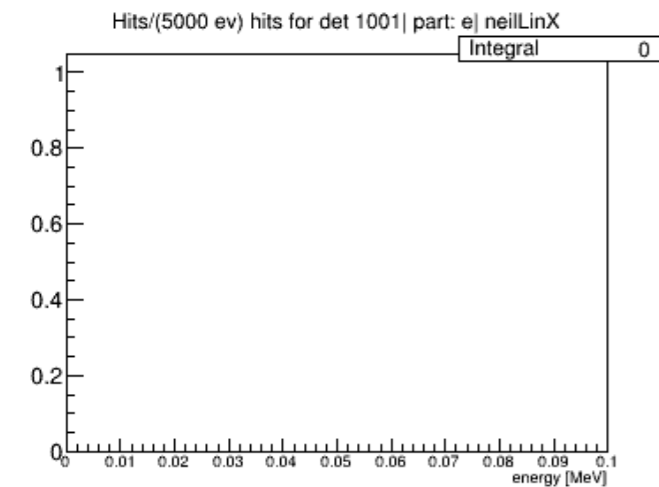
CREX - comparison

current setup



CREX - comparison

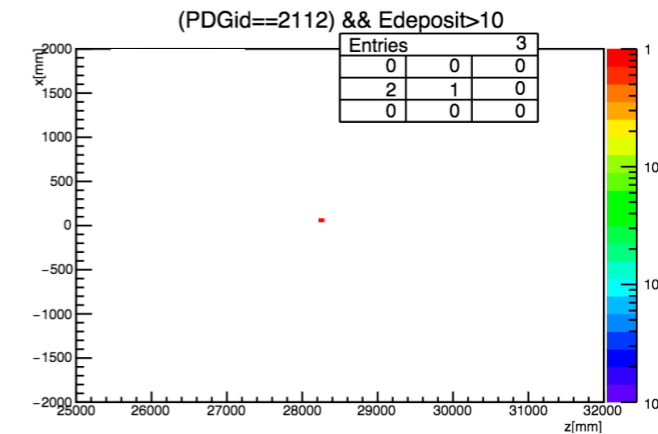
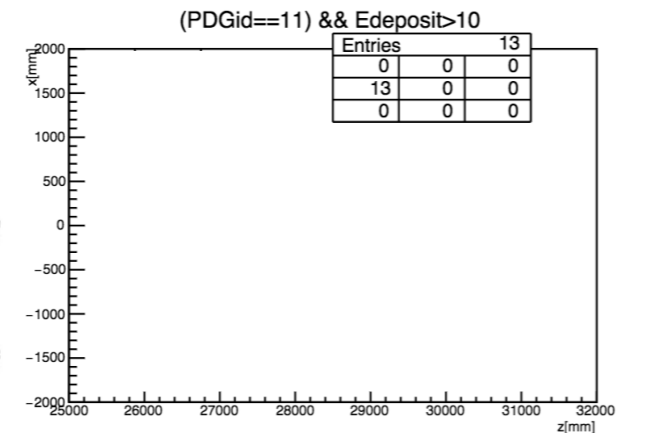
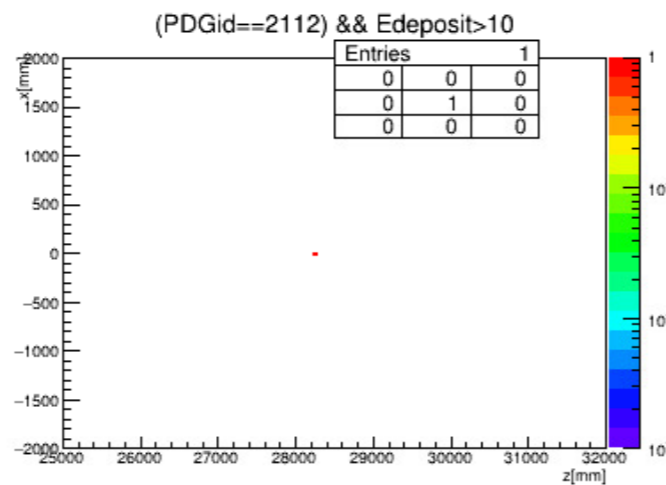
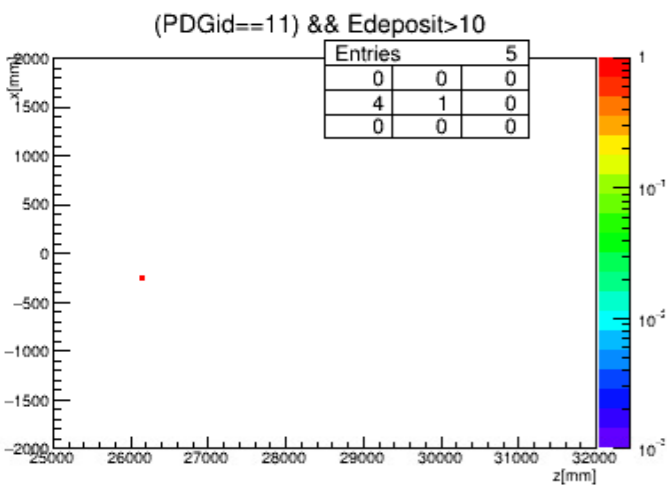
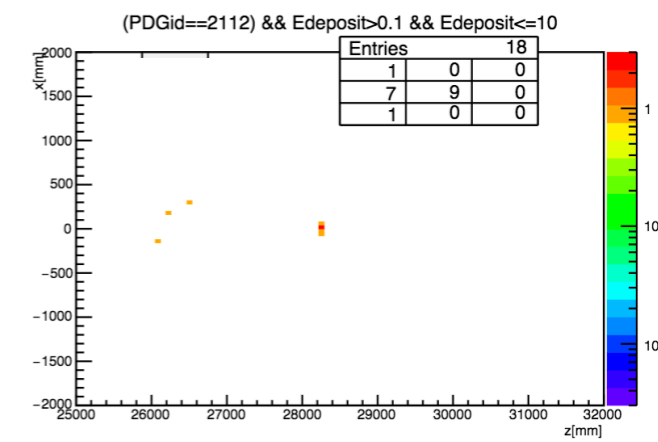
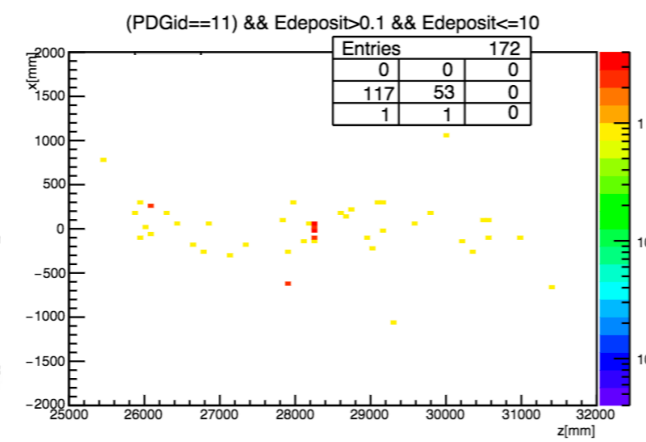
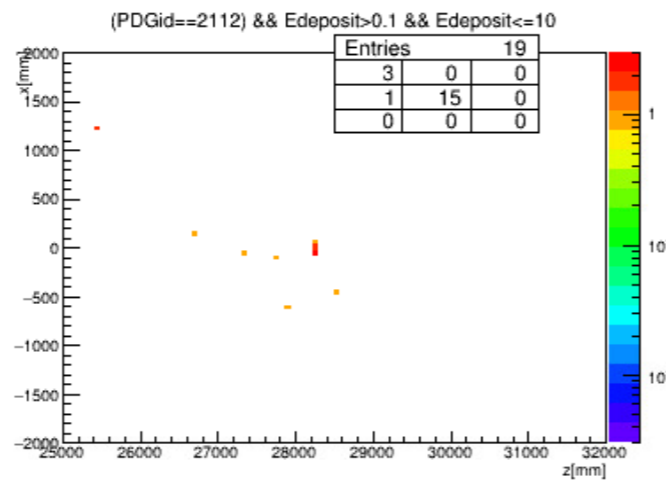
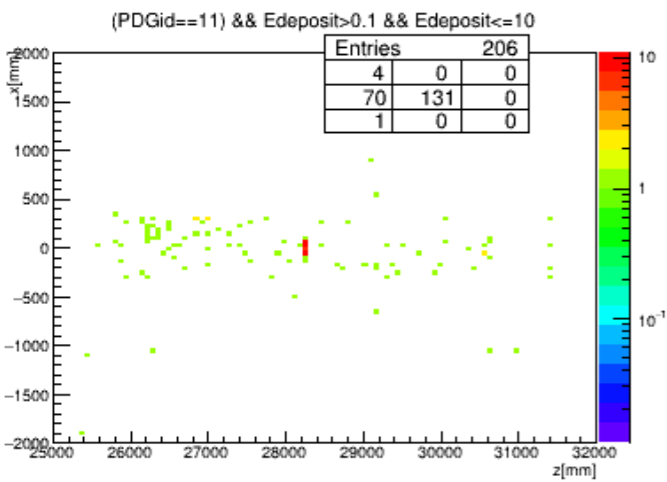
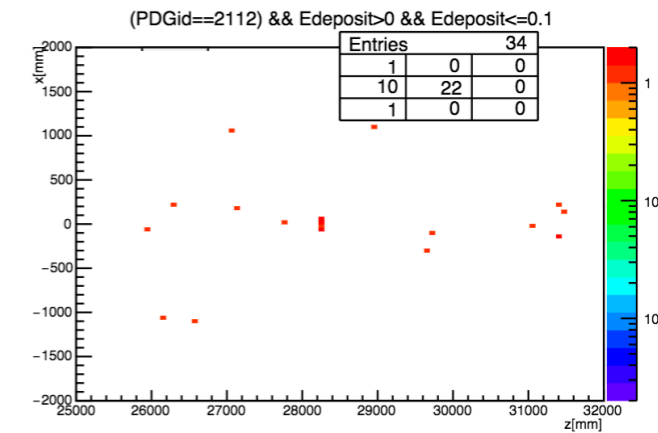
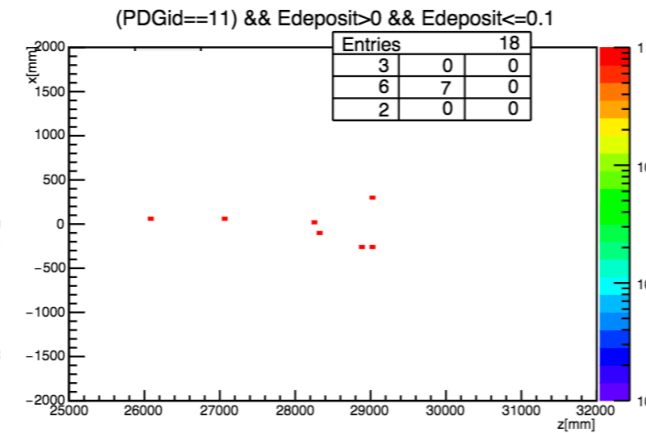
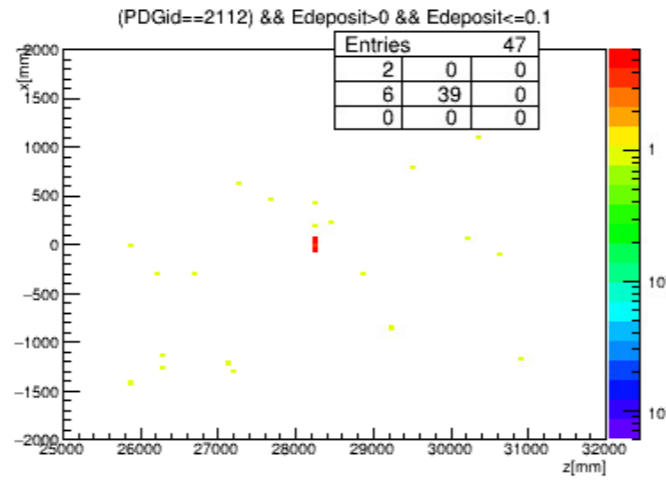
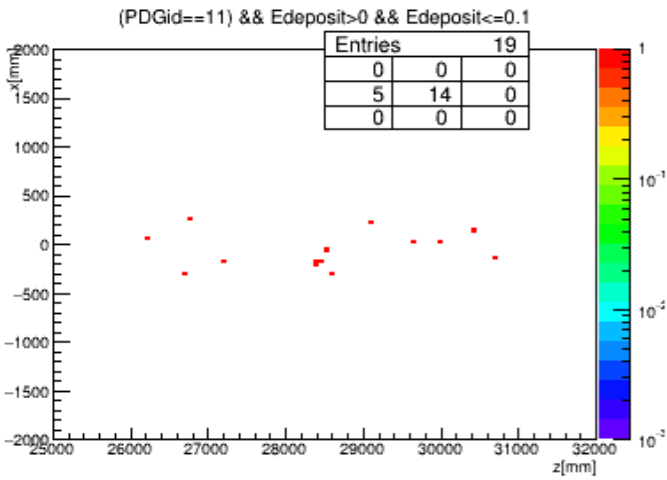
current setup



current setup + 1 ft concrete shield

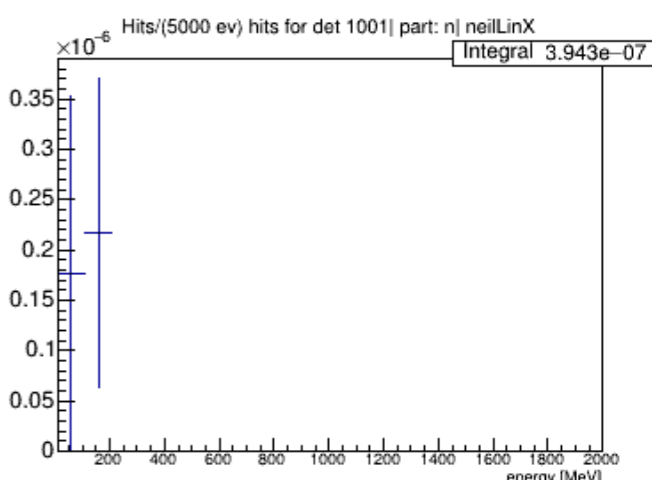
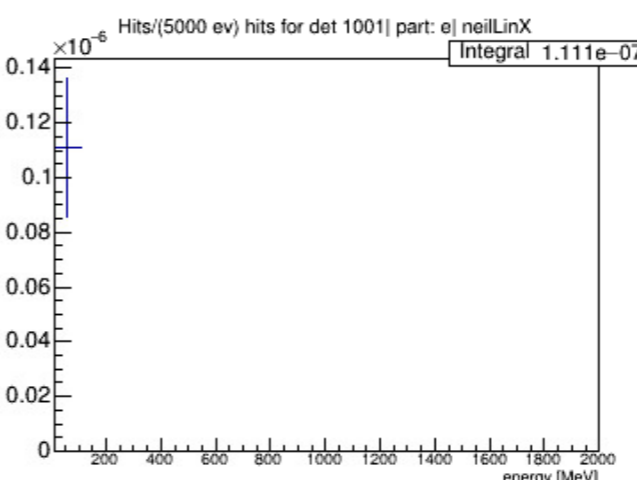
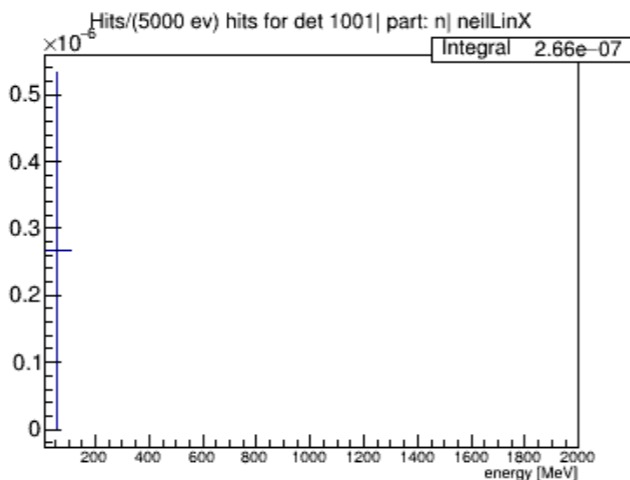
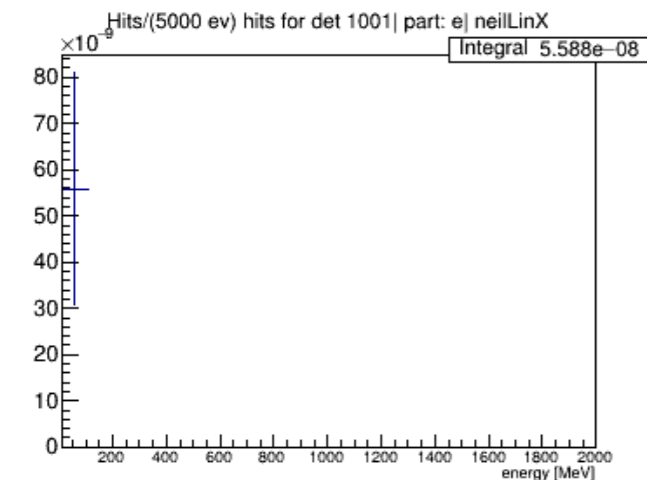
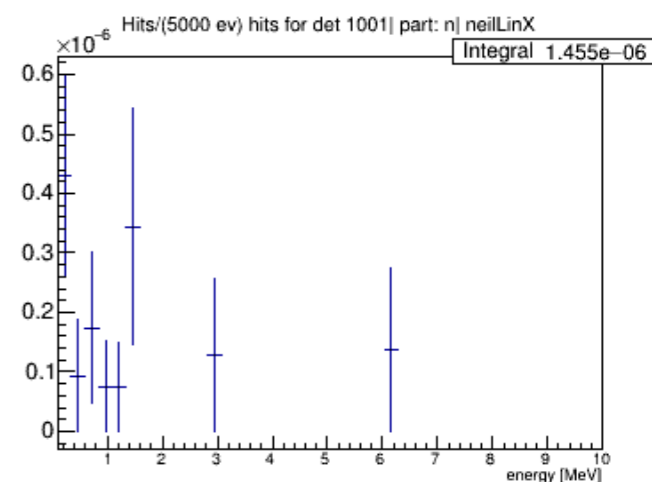
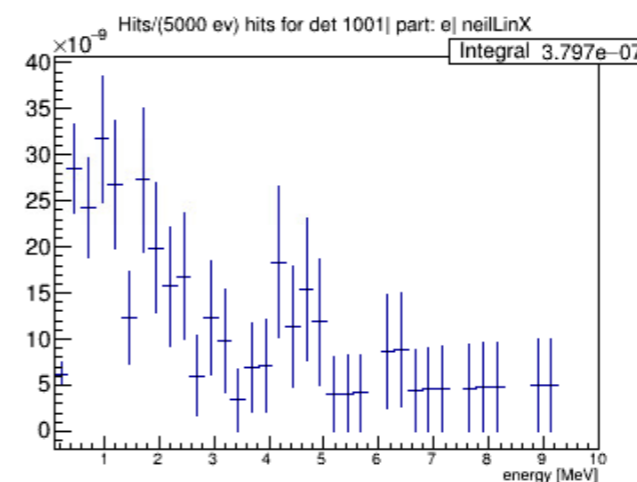
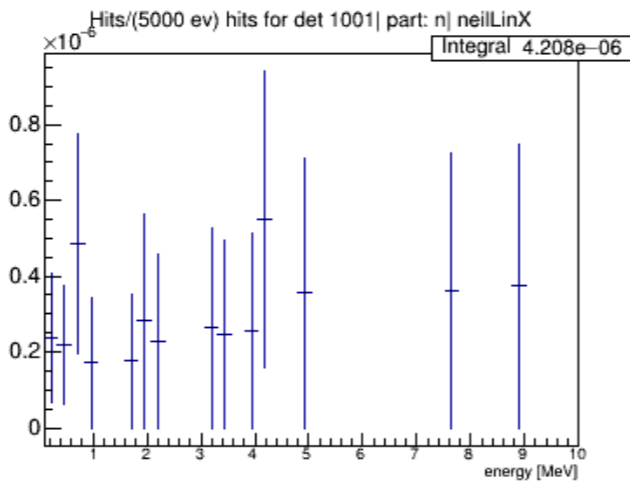
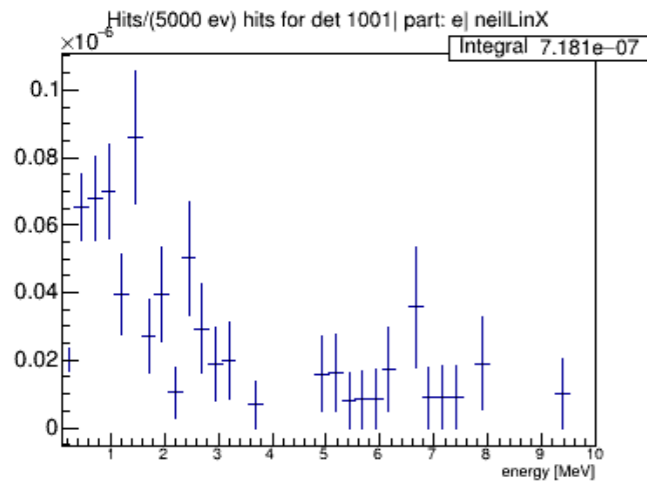
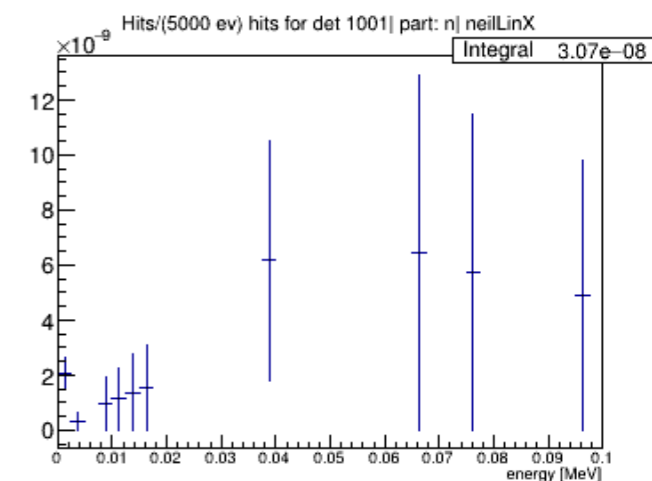
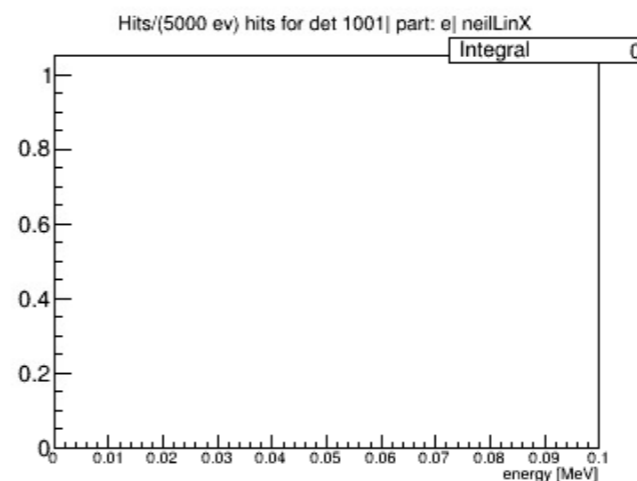
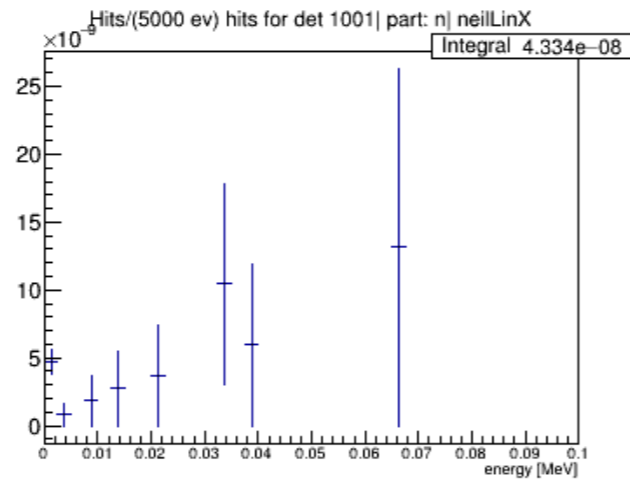
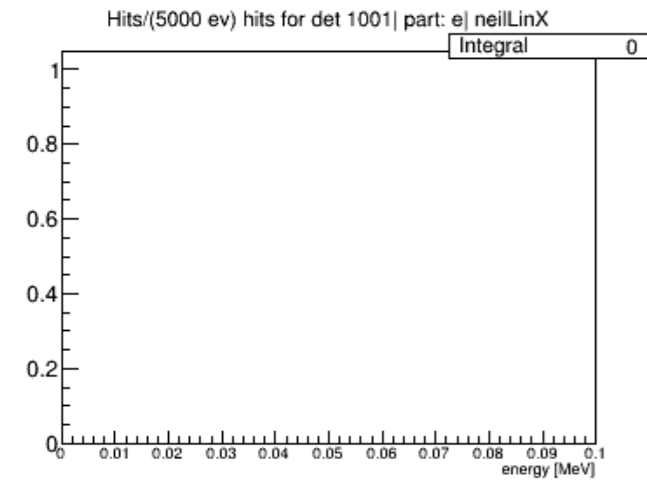
CREX - comparison

current setup



CREX - comparison

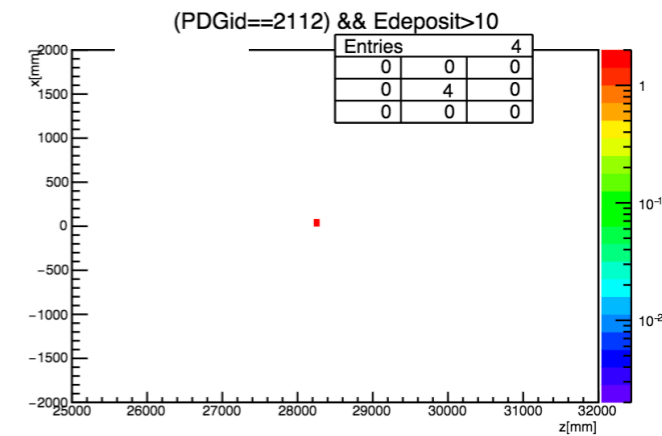
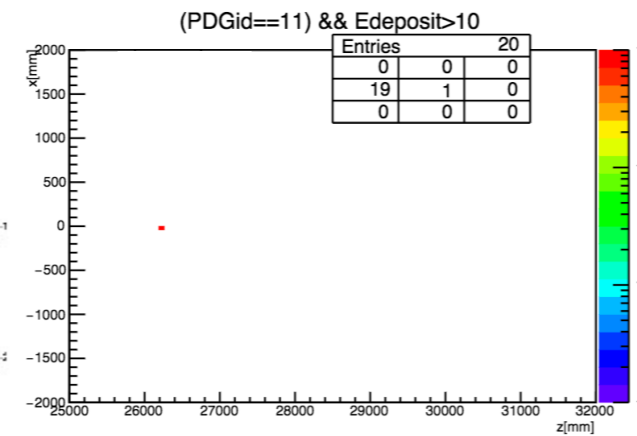
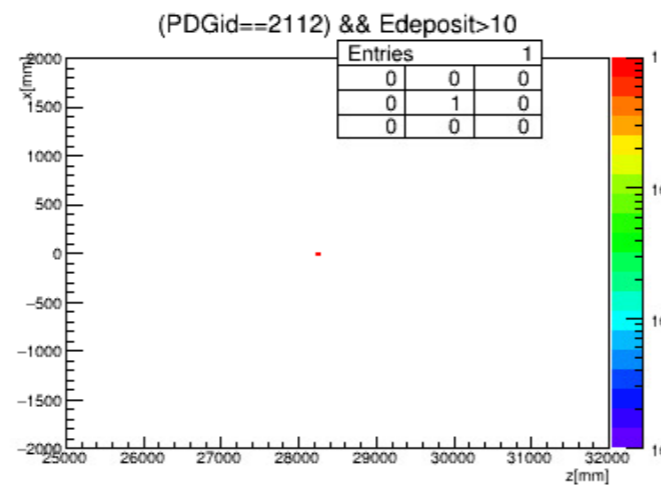
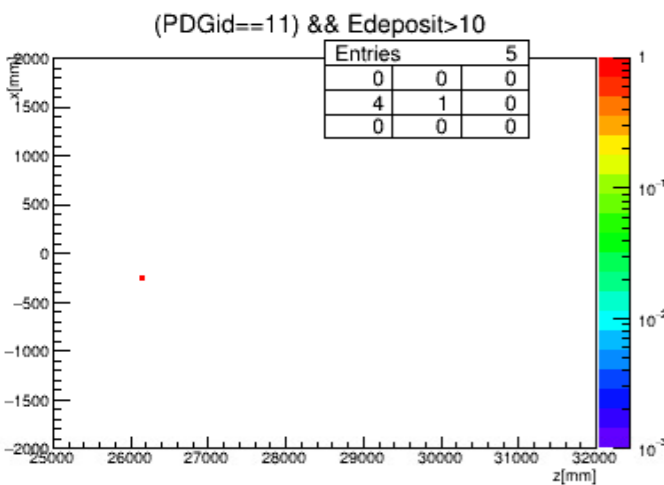
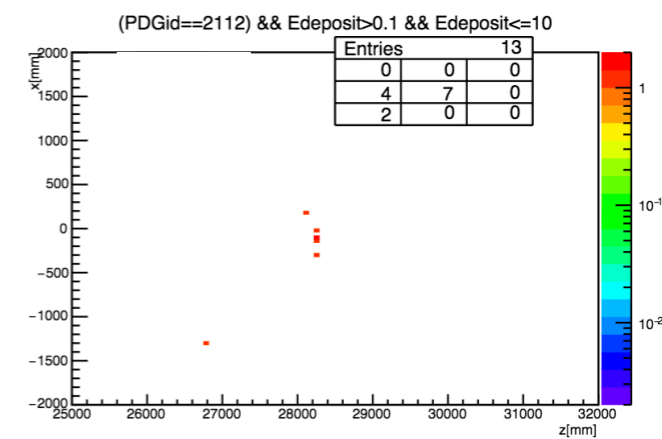
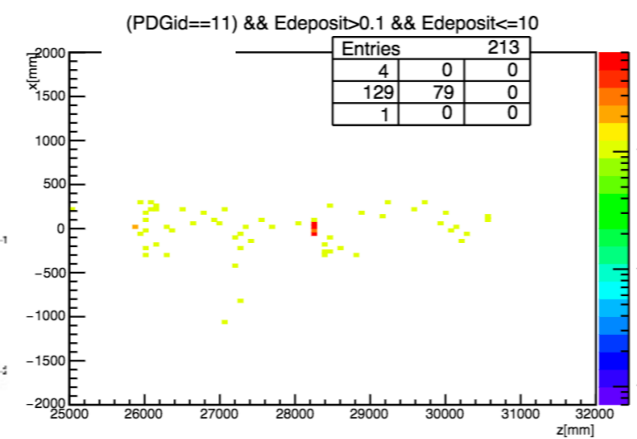
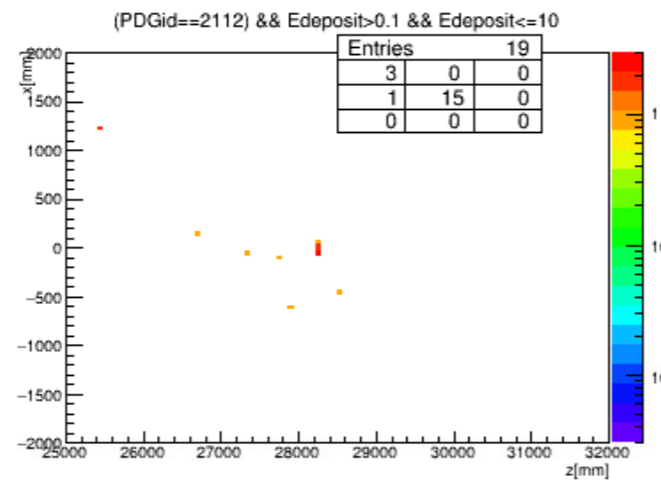
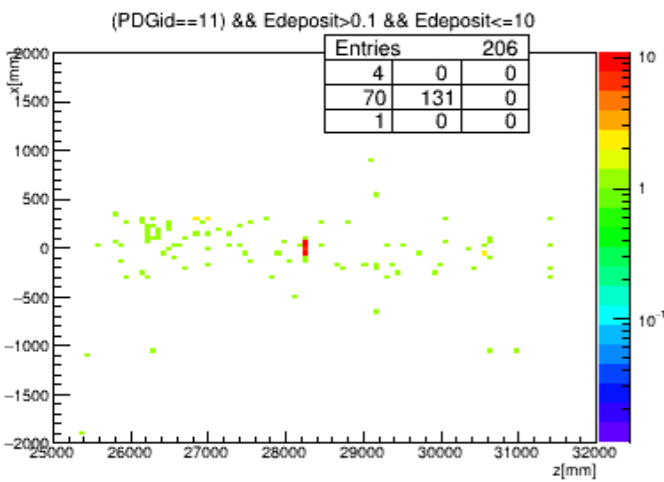
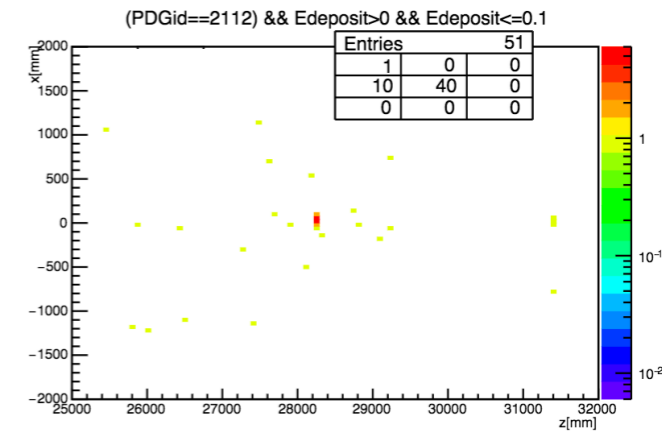
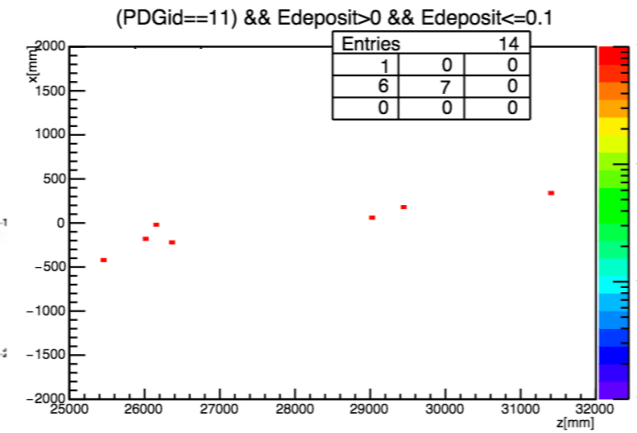
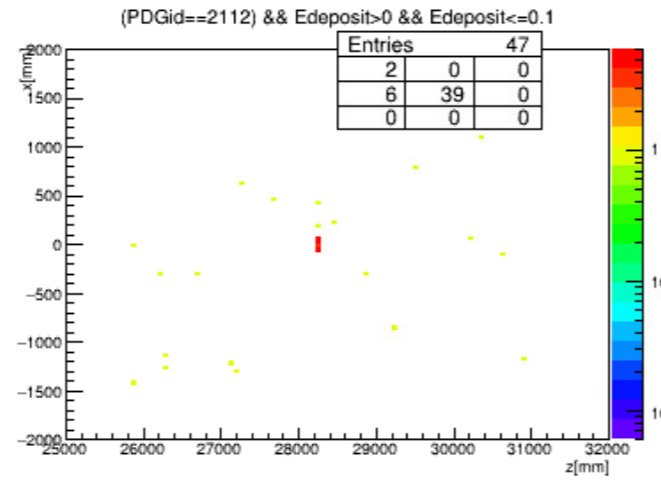
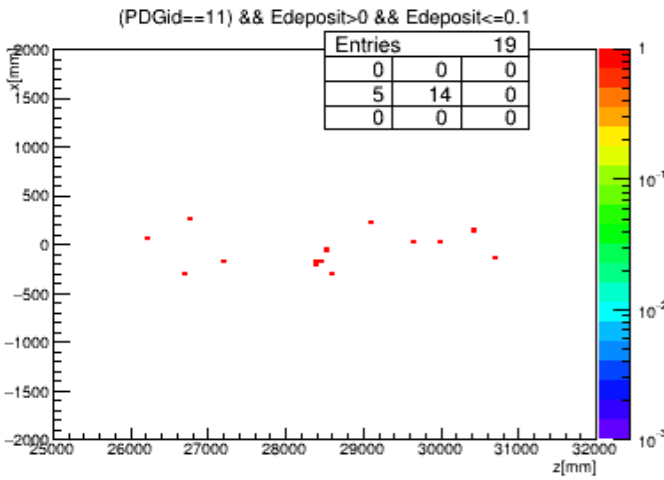
current setup



current setup + 2 ft concrete shield

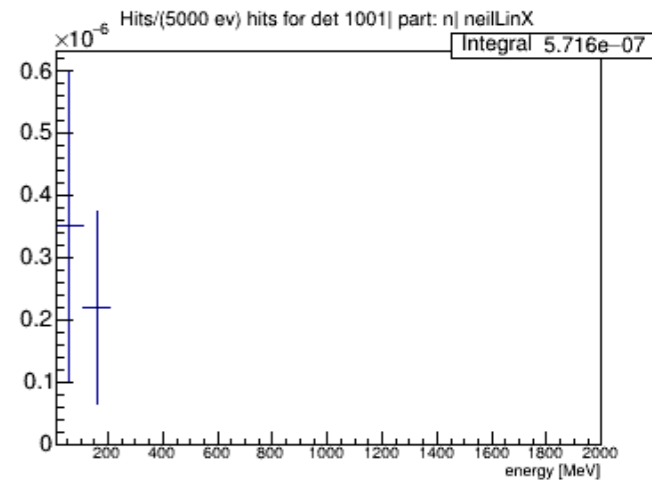
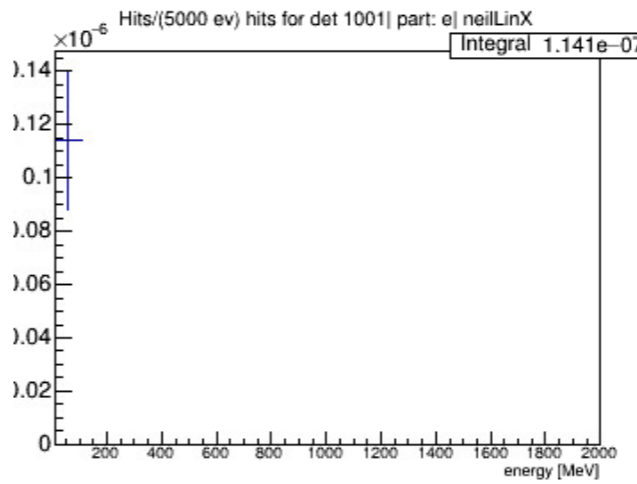
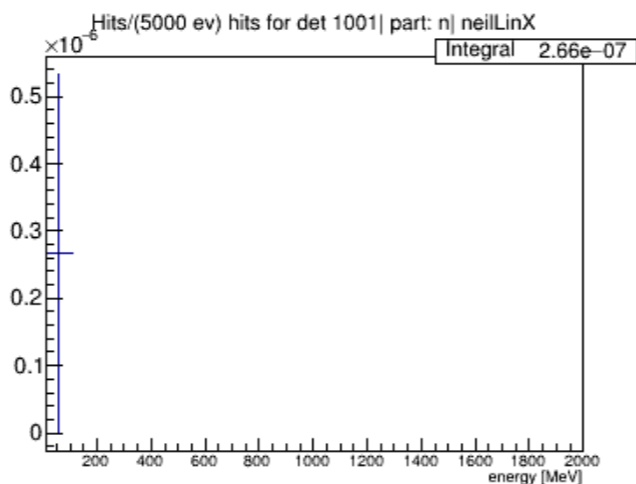
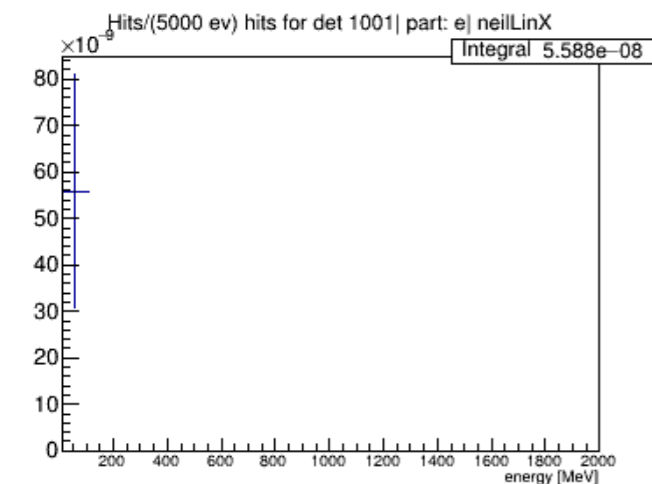
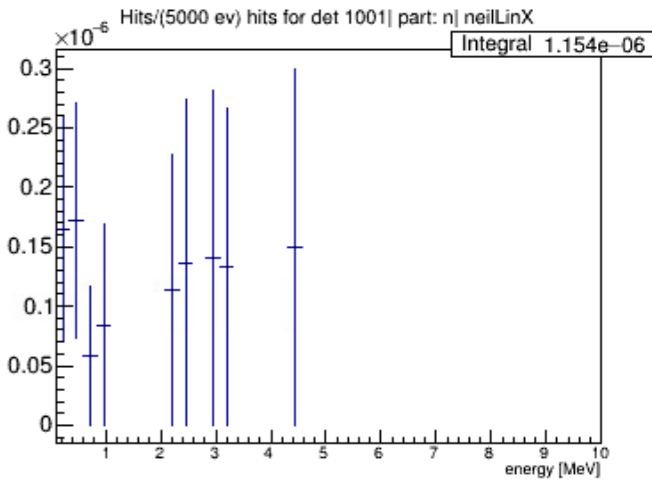
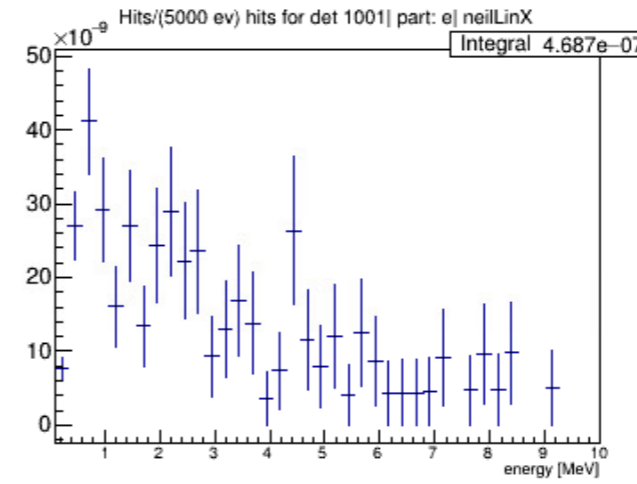
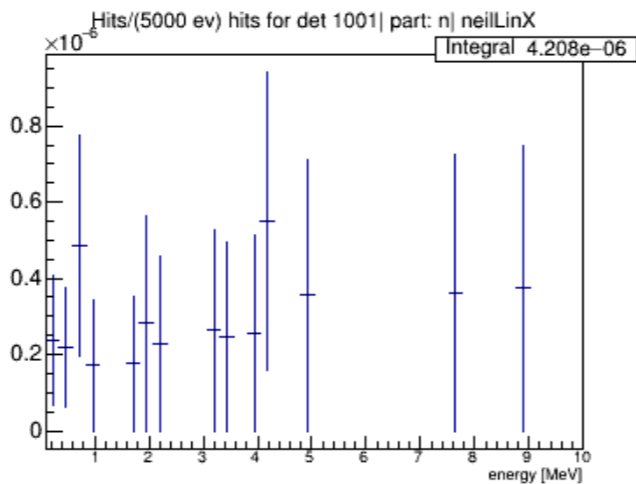
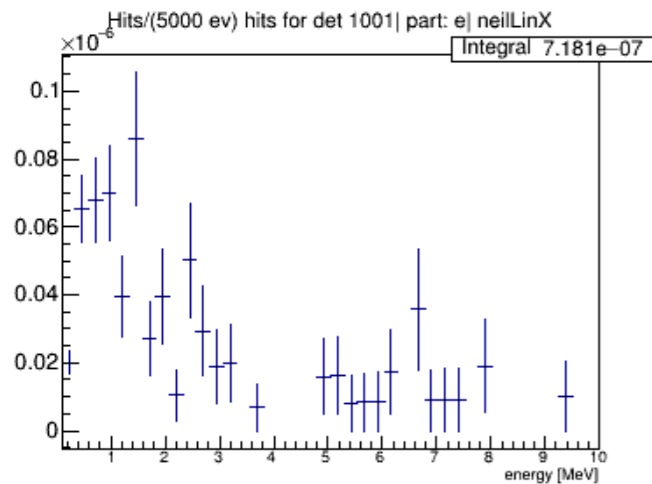
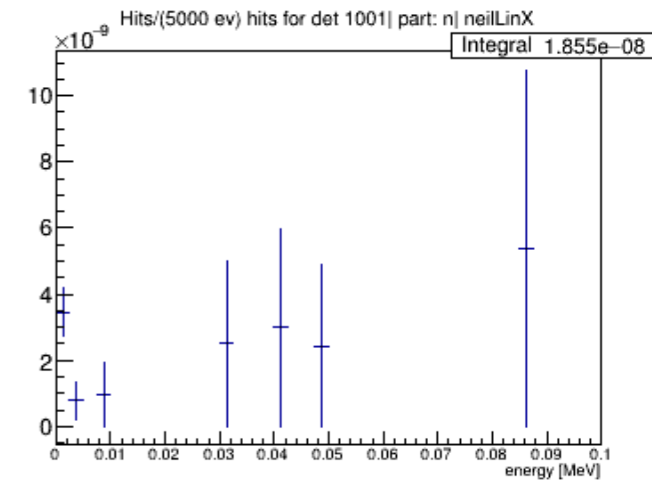
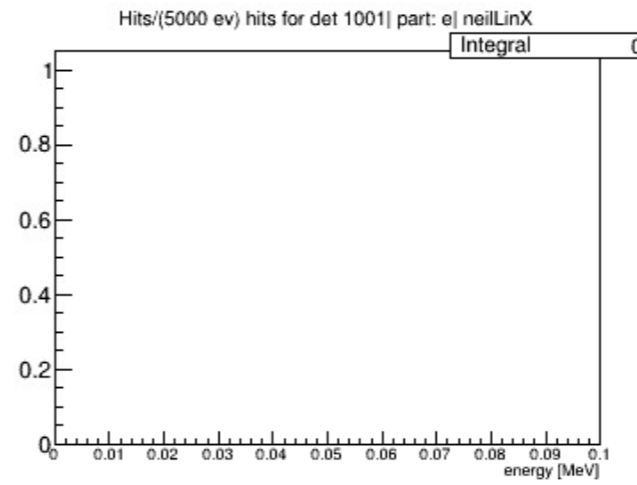
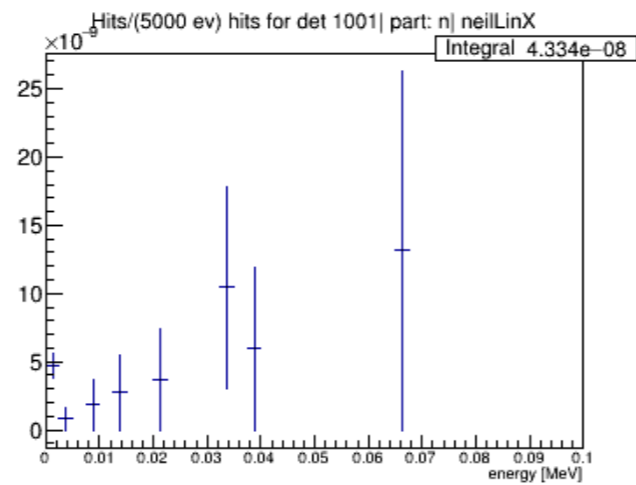
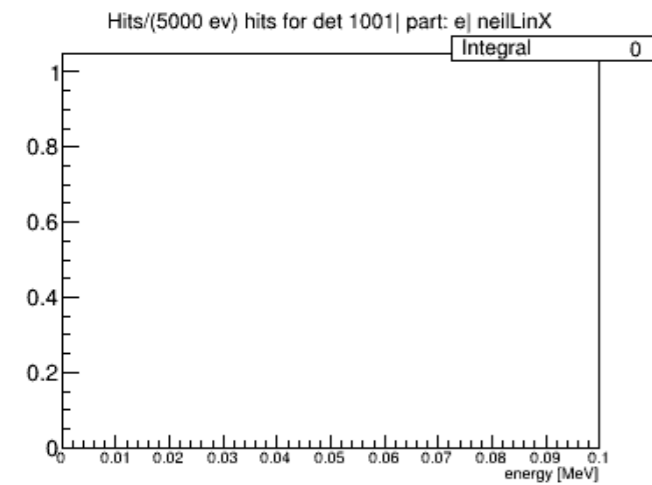
CREX - comparison

current setup



CREX - comparison

current setup

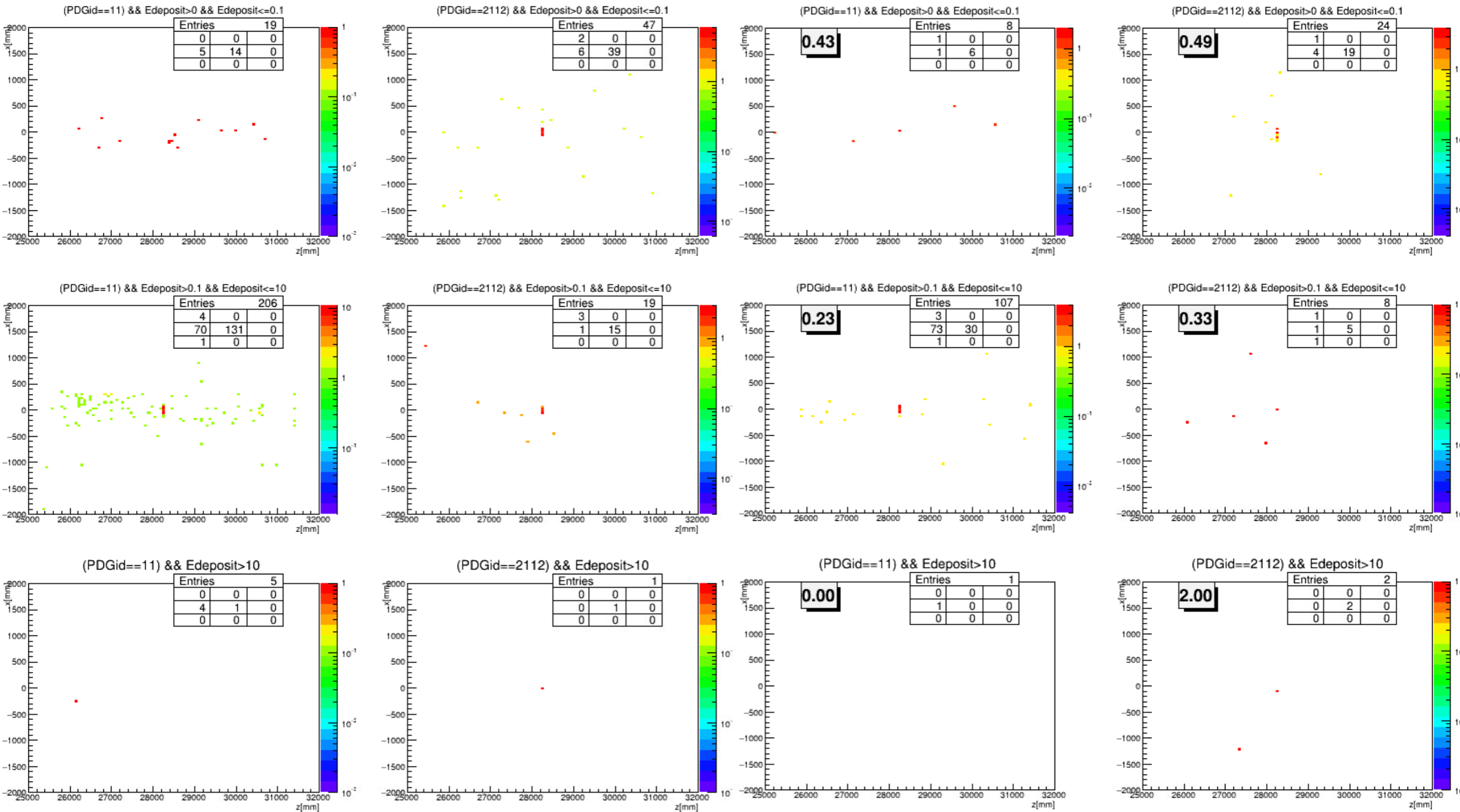


current setup + 0.5 ft concrete shield

CREX - comparison

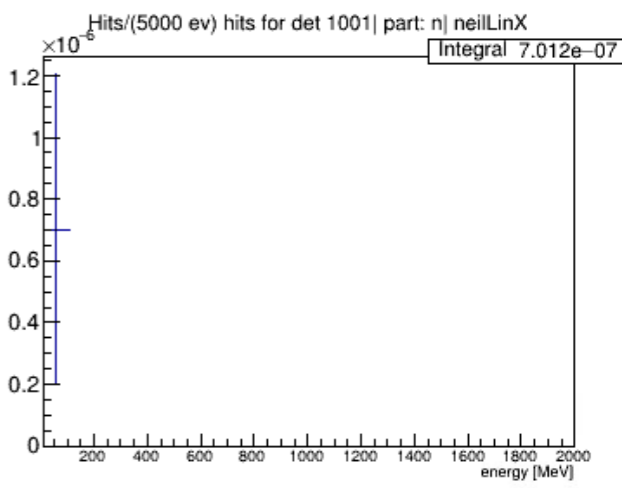
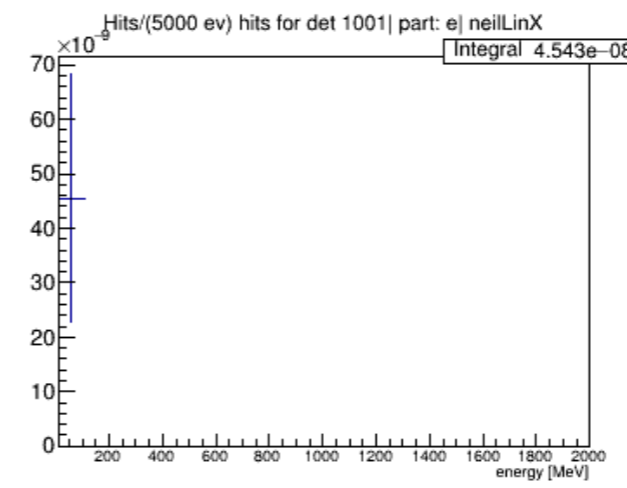
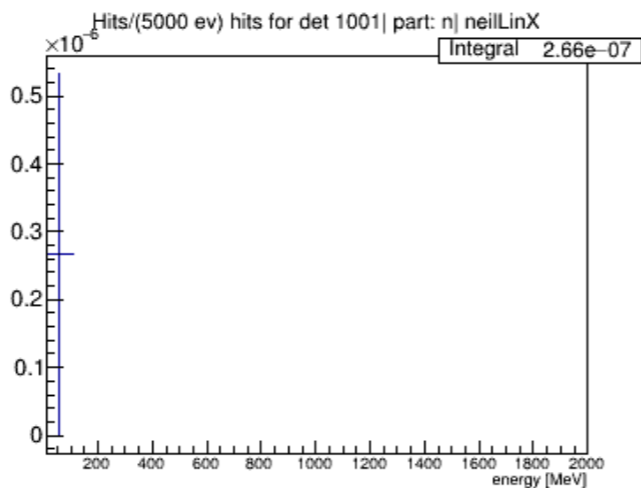
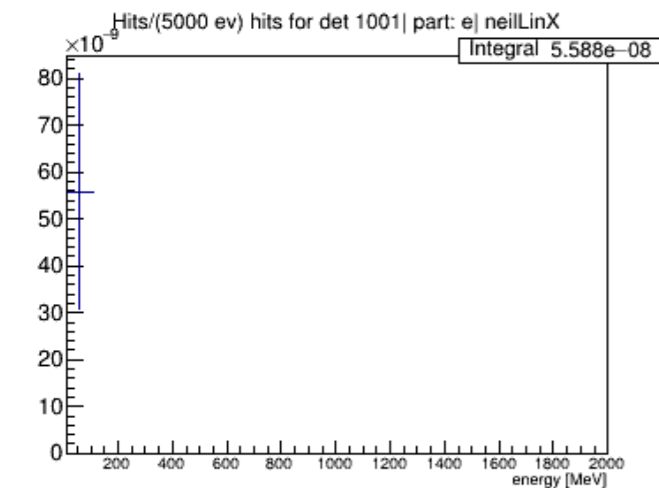
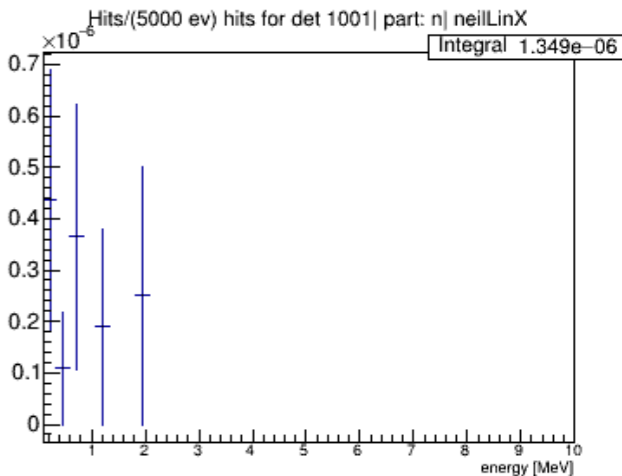
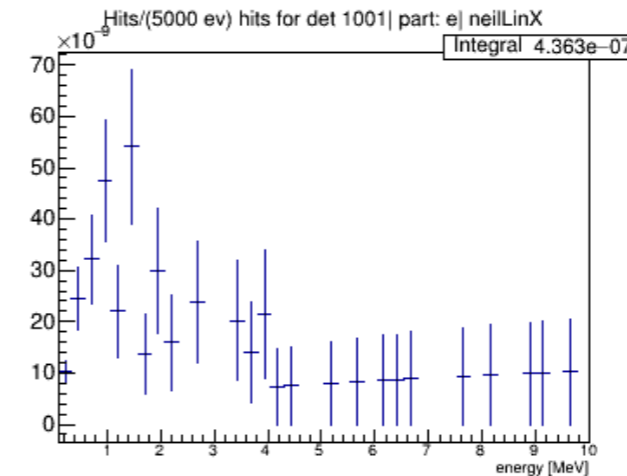
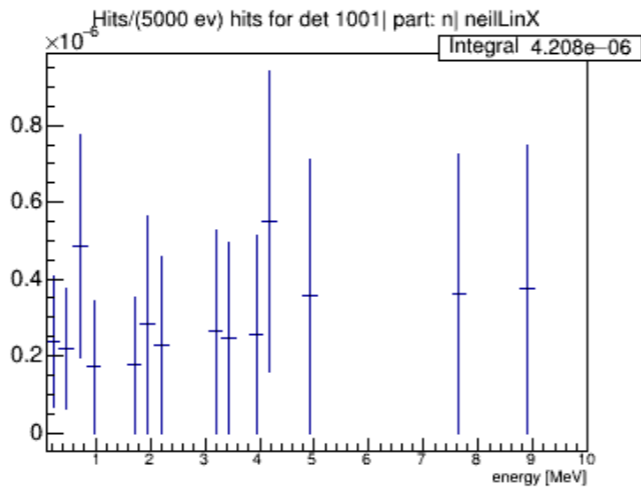
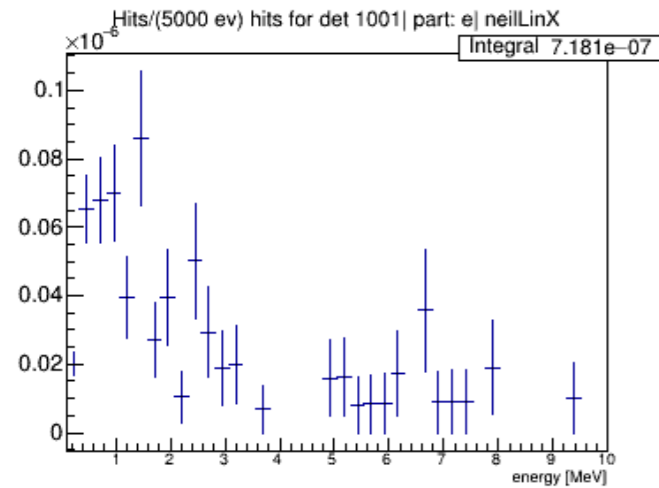
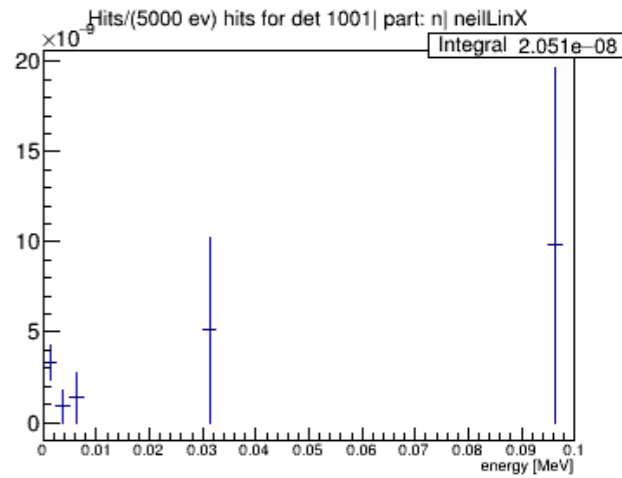
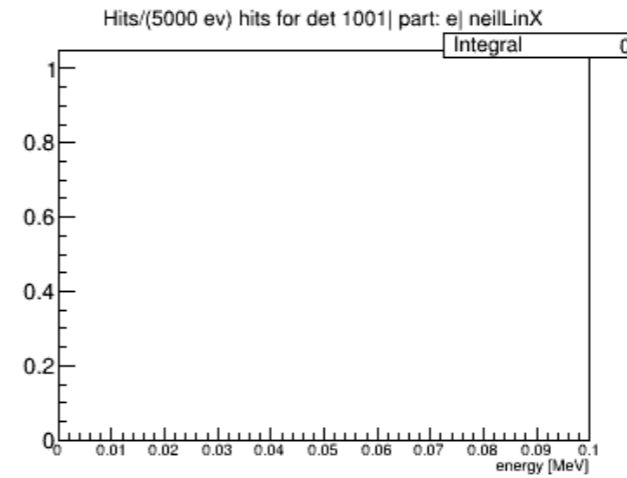
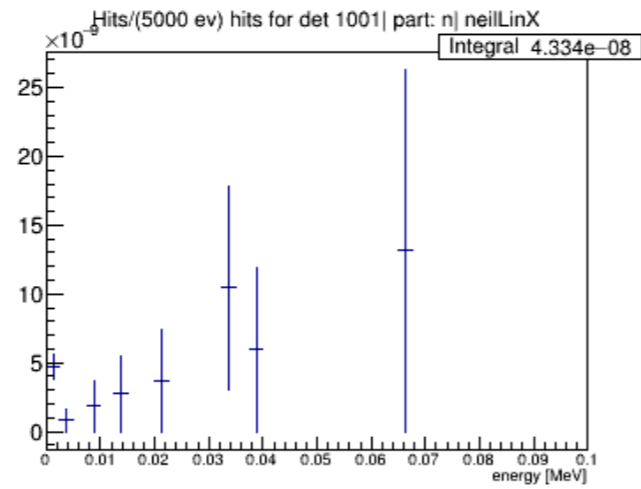
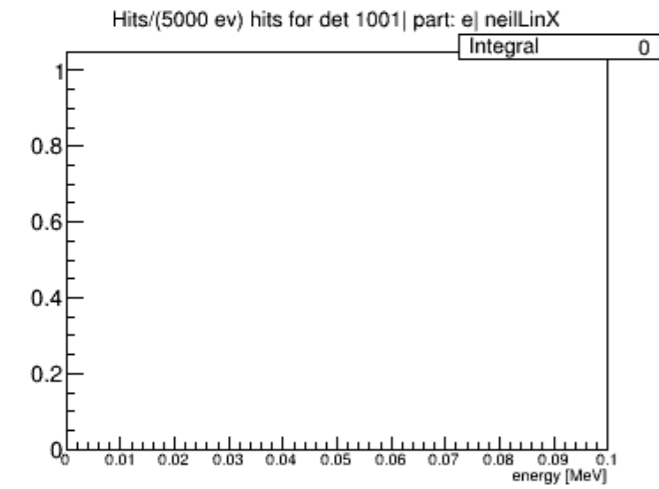
current setup

current setup + 1 ft Poly shield



CREX - comparison

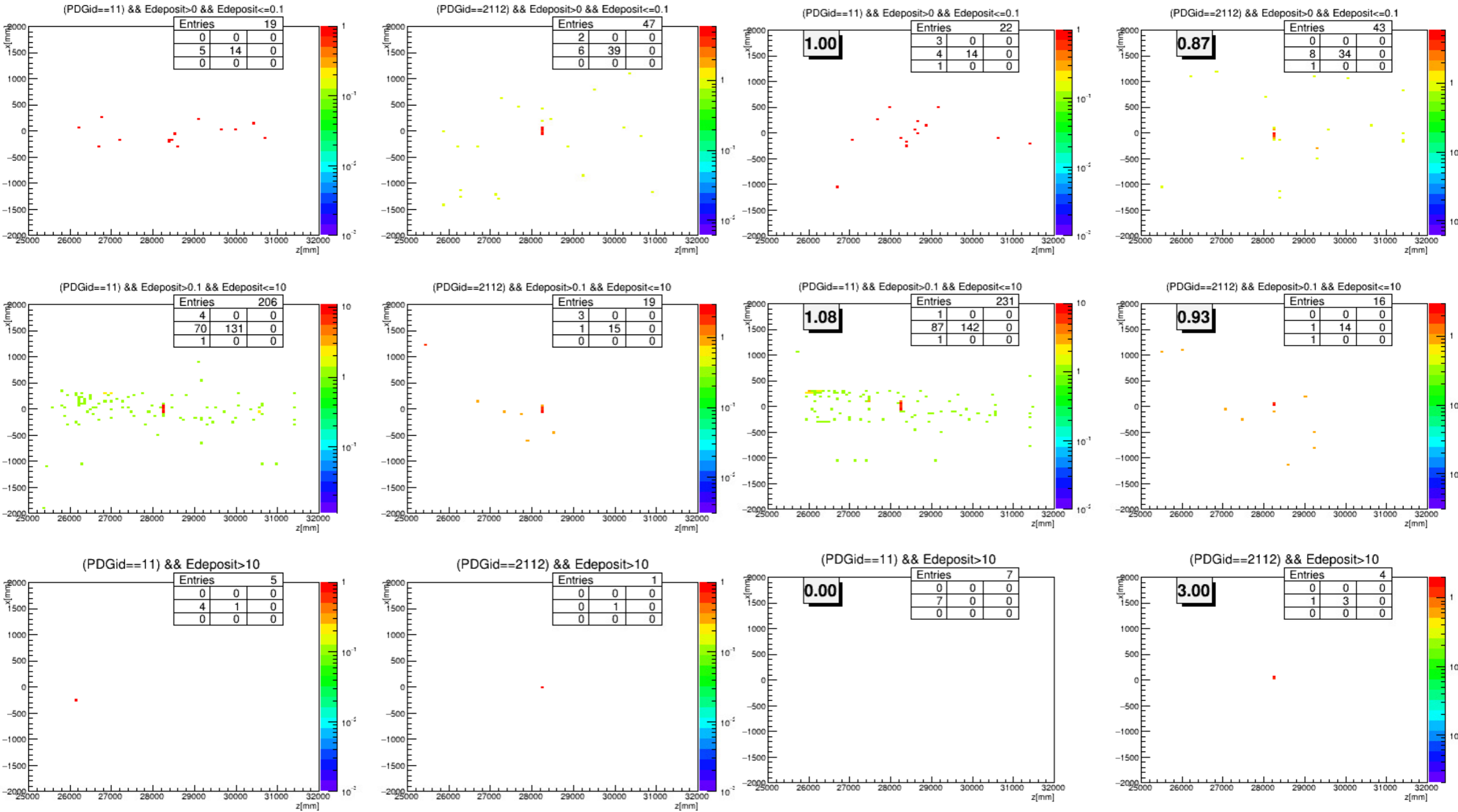
current setup



CREX - comparison

current setup

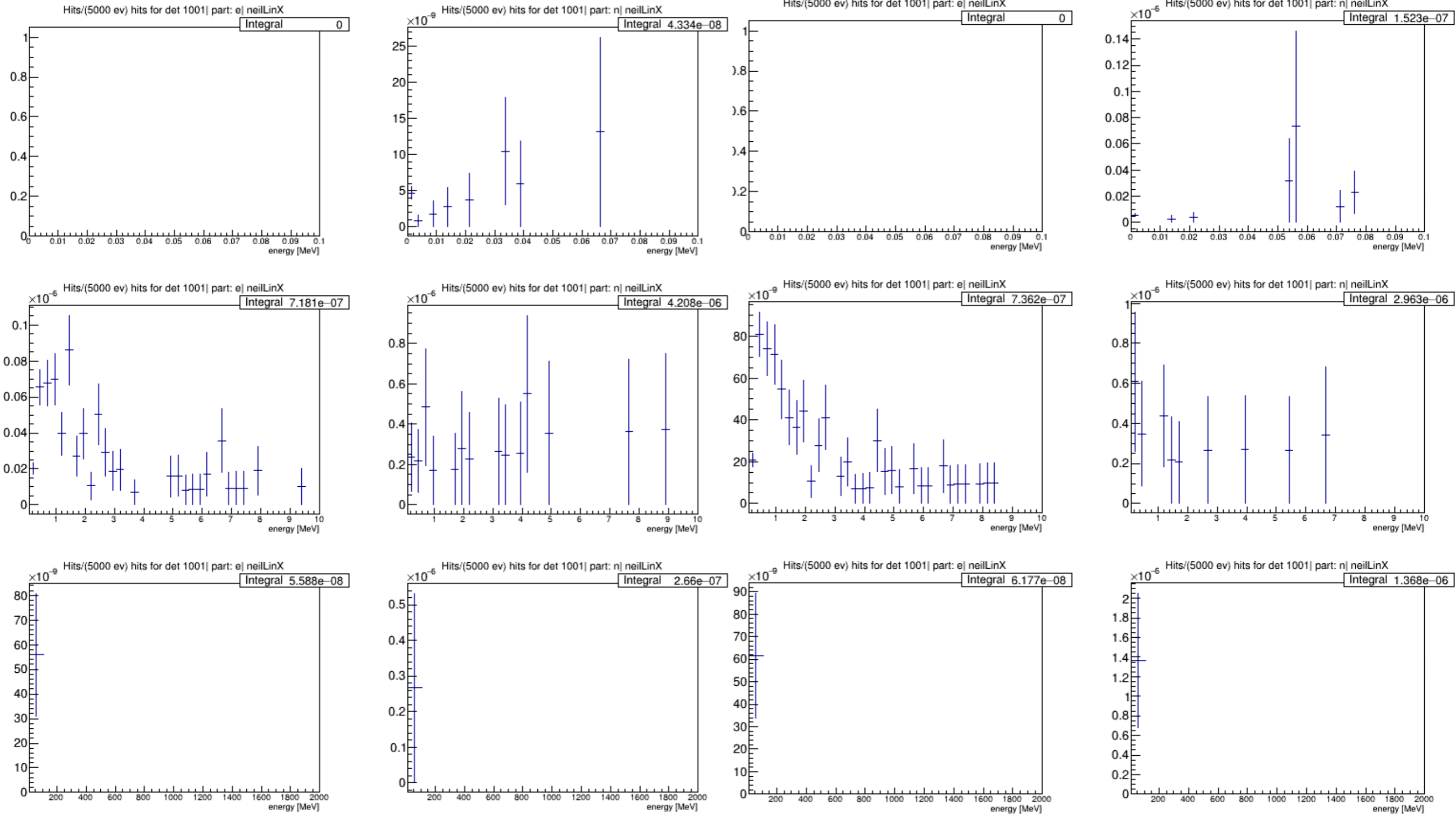
current setup + 2PipeSeptum



CREX - comparison

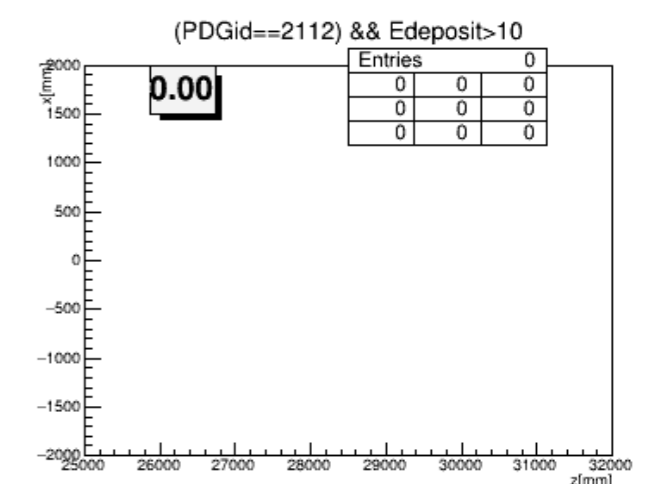
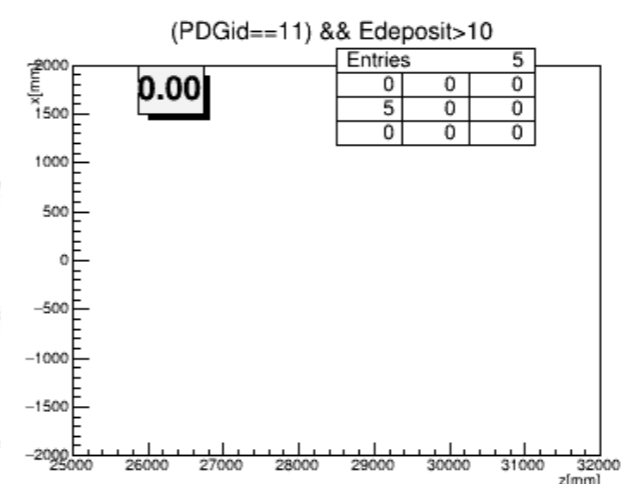
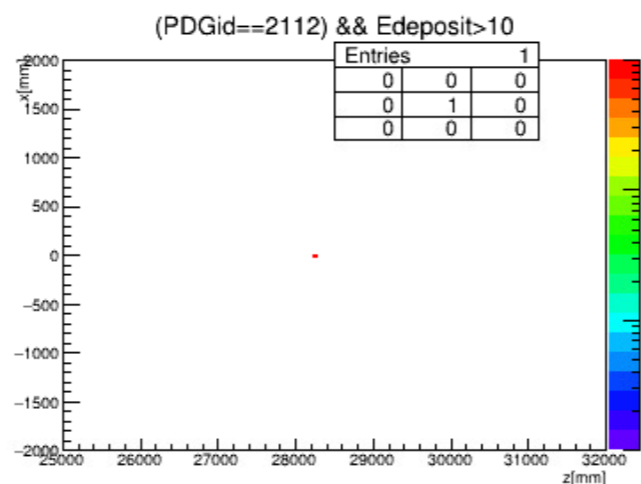
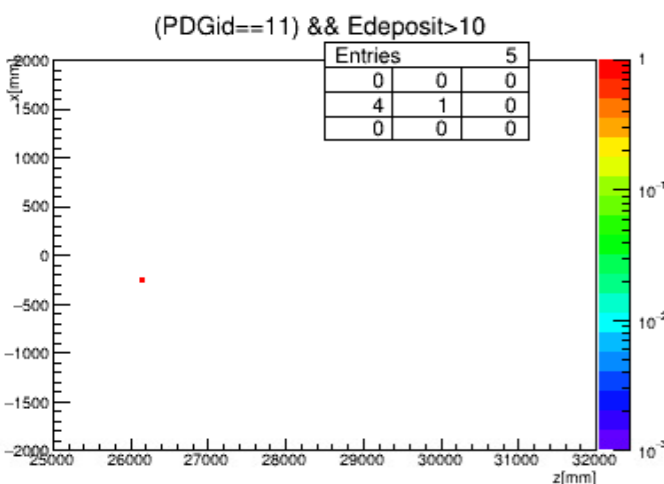
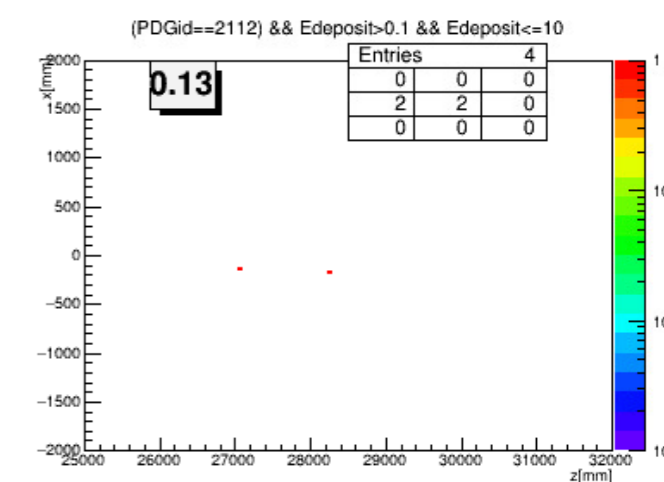
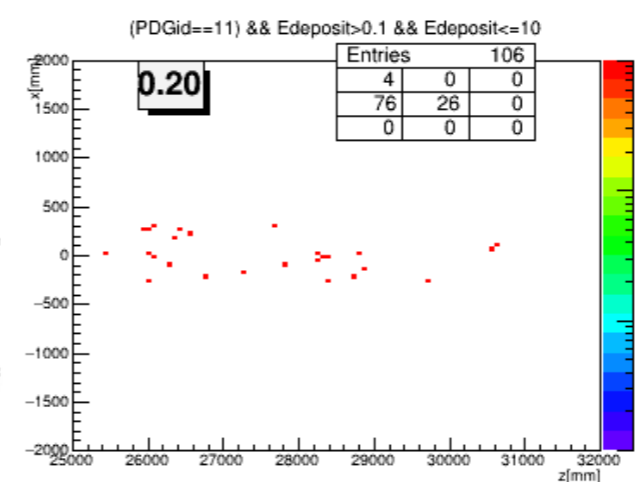
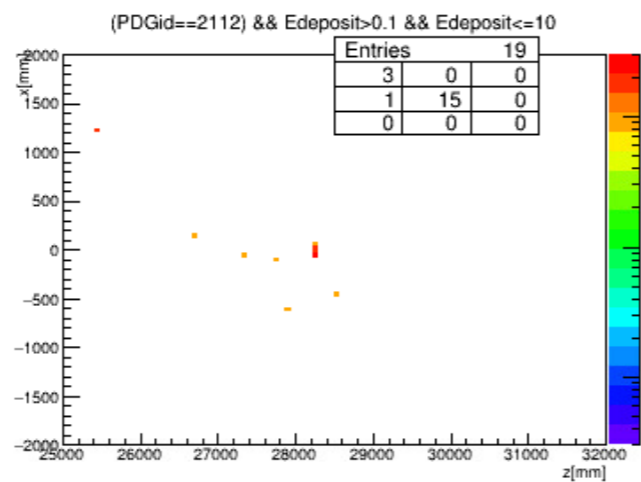
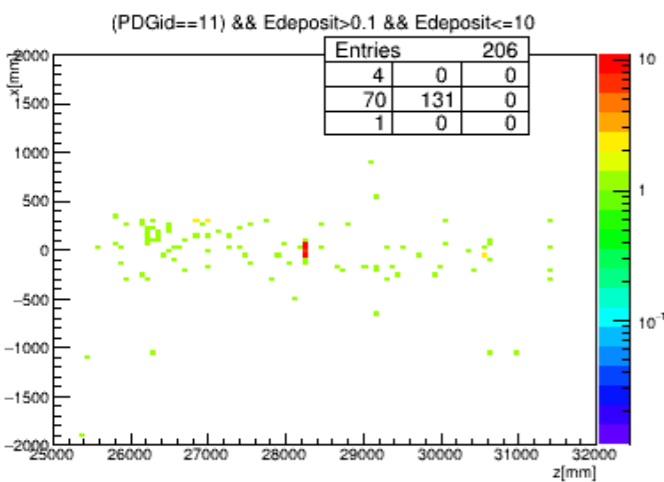
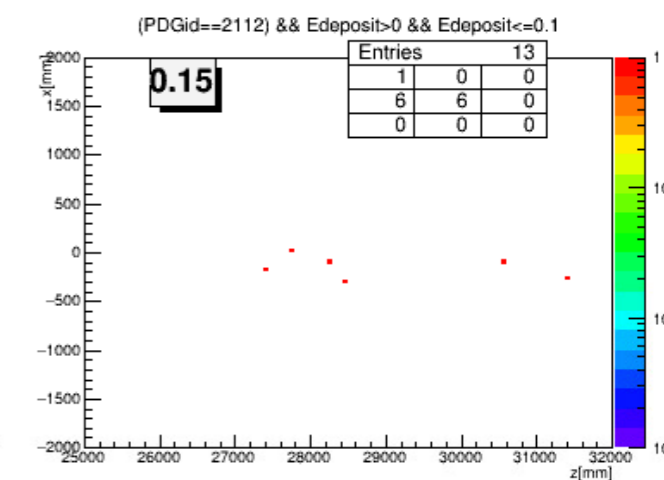
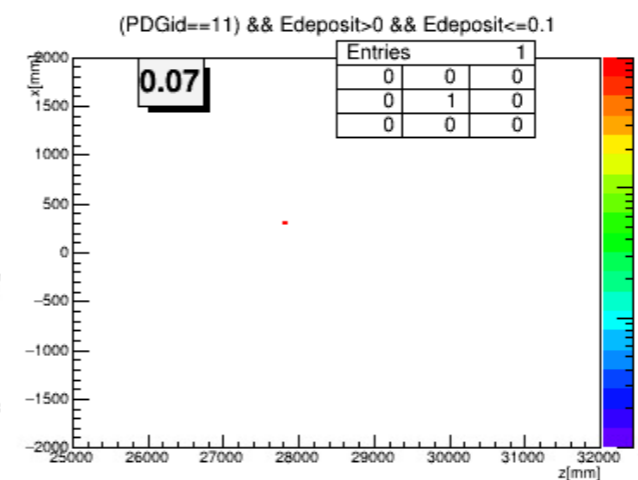
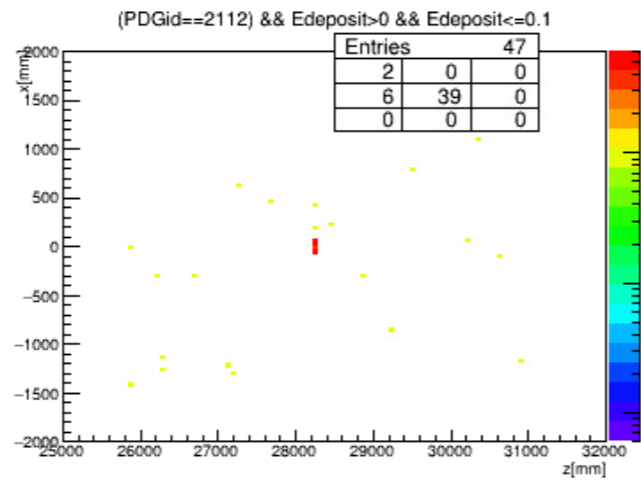
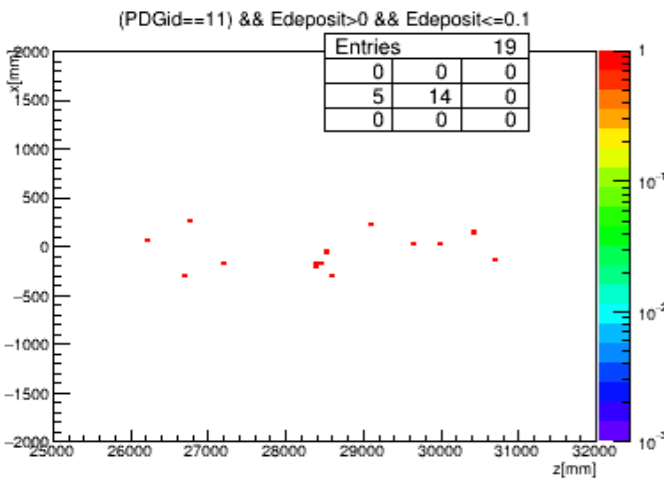
current setup

current setup + 2PipeSeptum



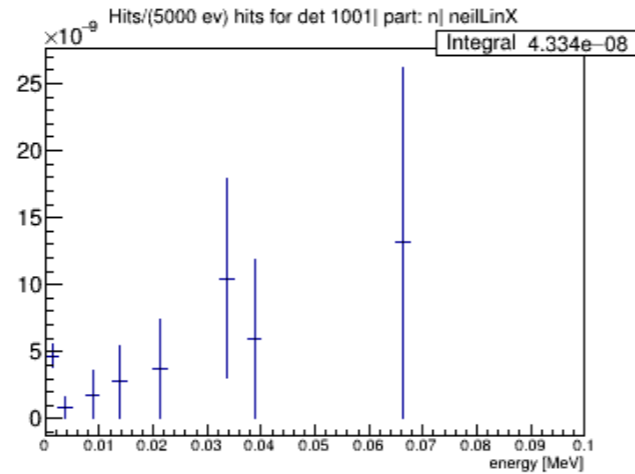
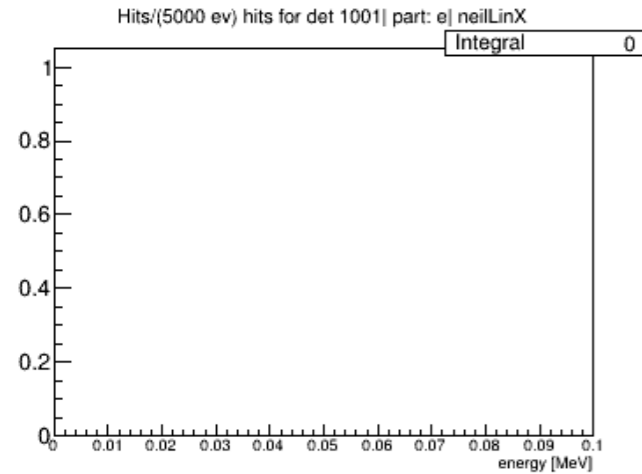
CREX - comparison

current setup

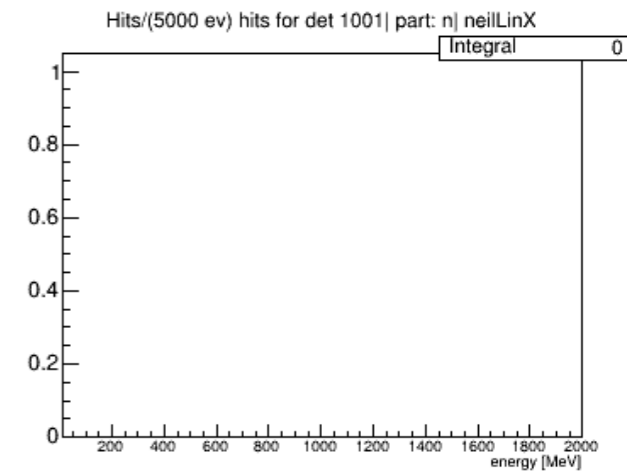
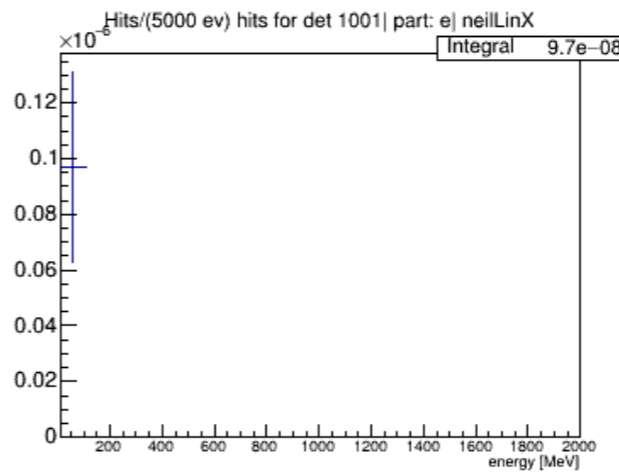
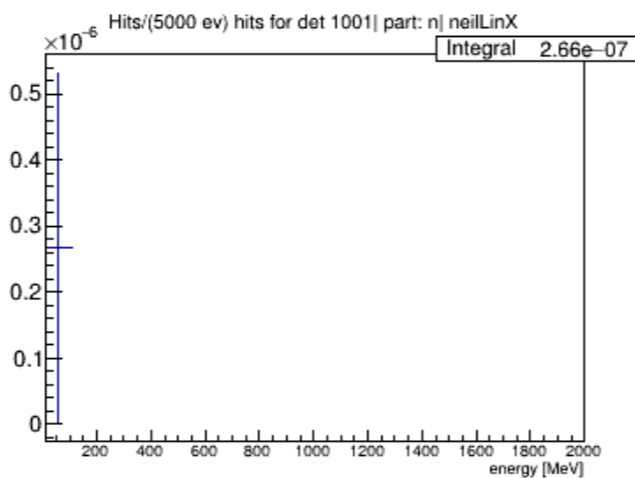
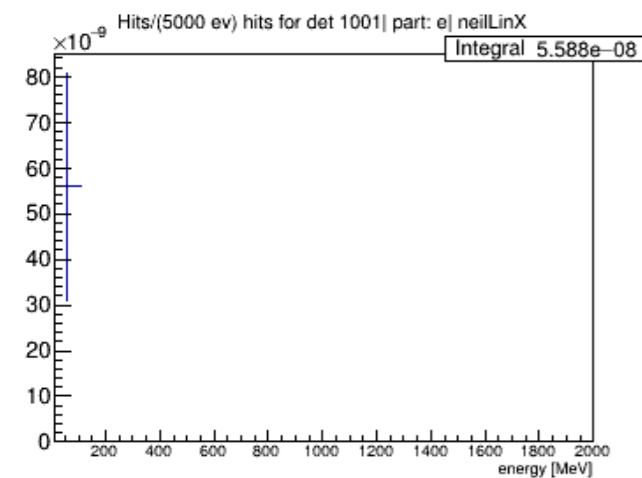
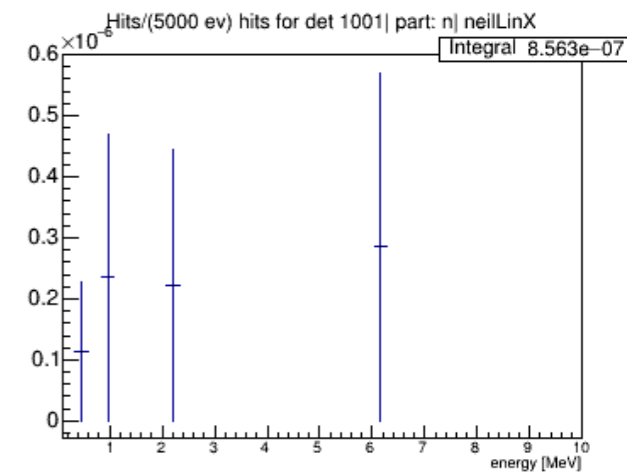
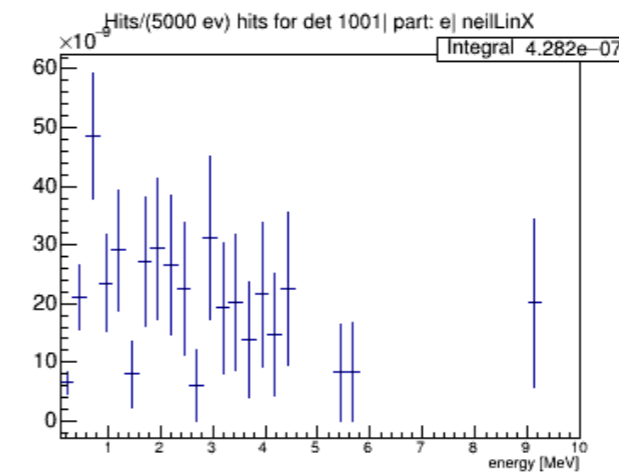
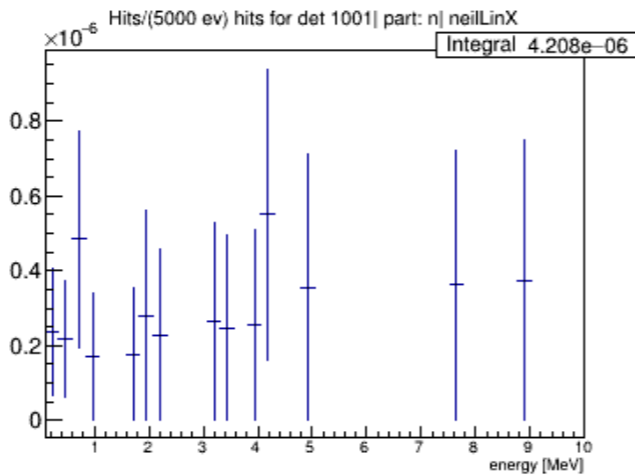
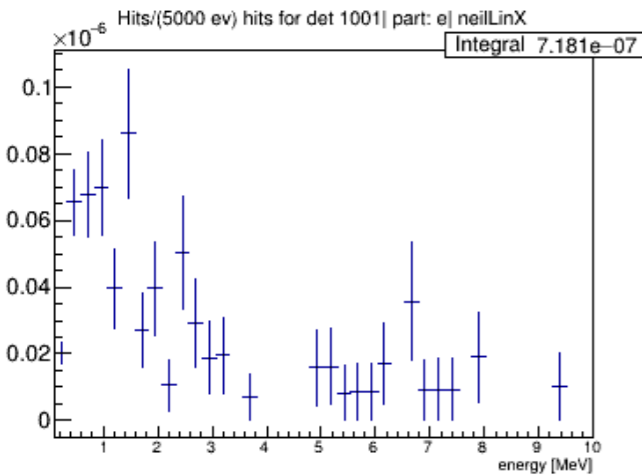
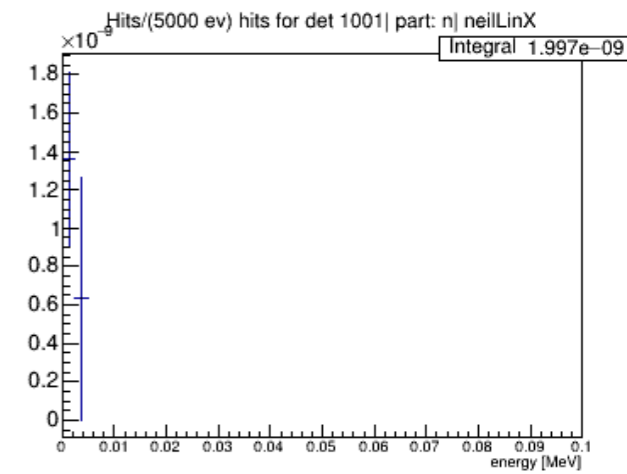
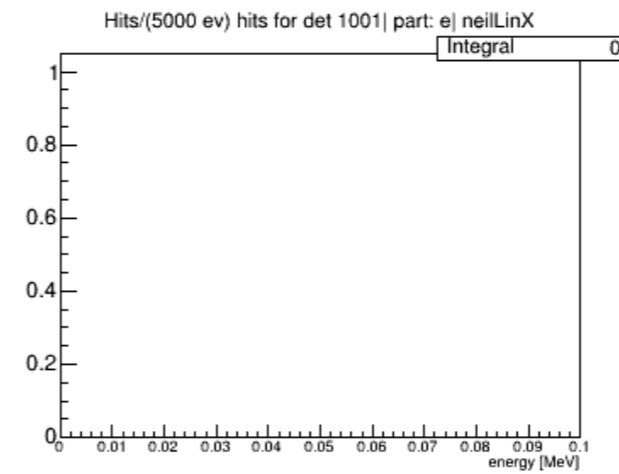


CREX - comparison

current setup



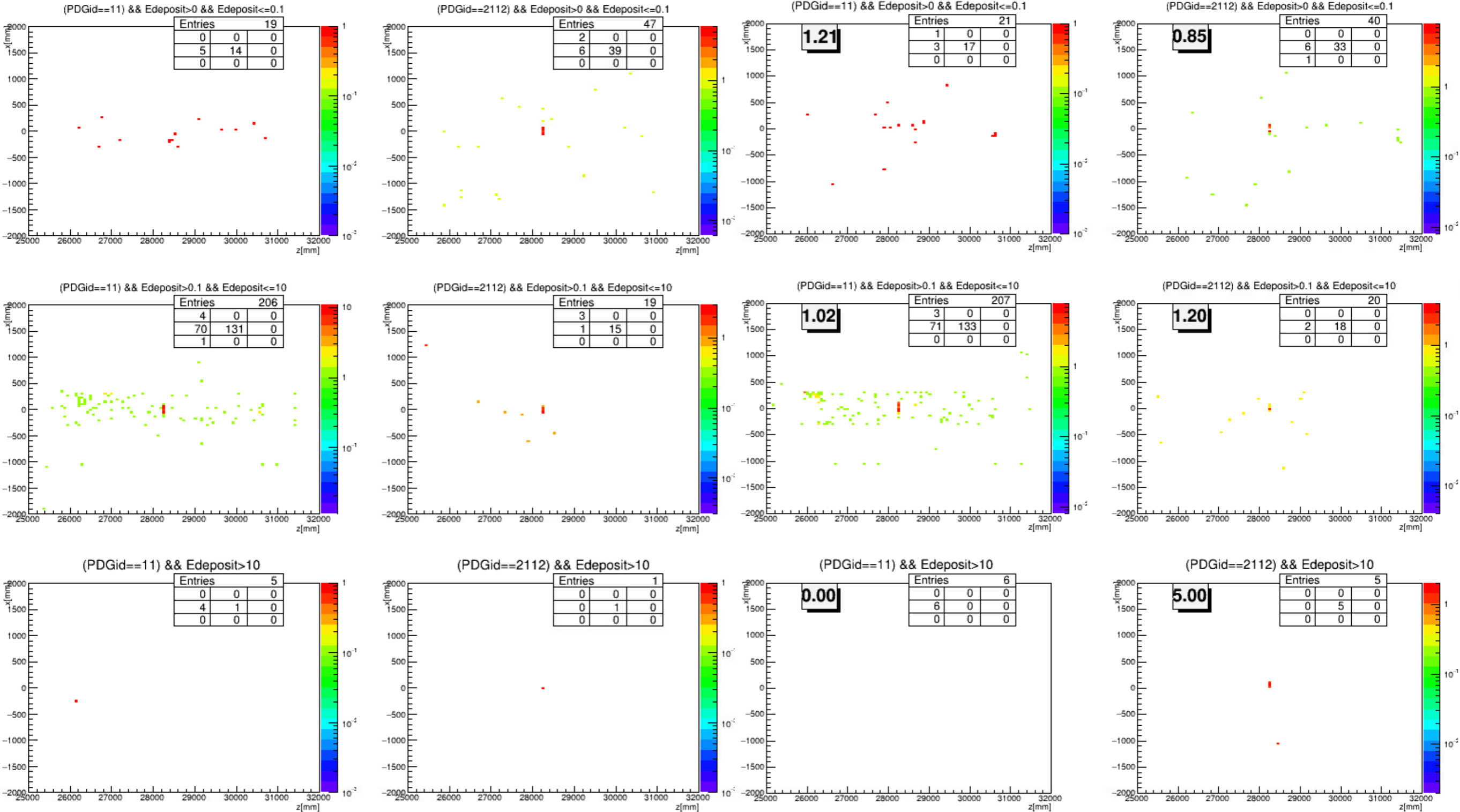
current setup + 4 in Donut+ 1 ft concrete shield



CREX - comparison

current setup + 2PipeSeptum+donut shield

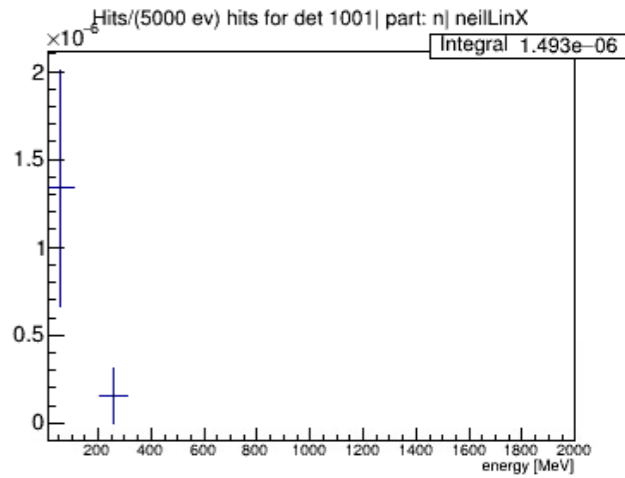
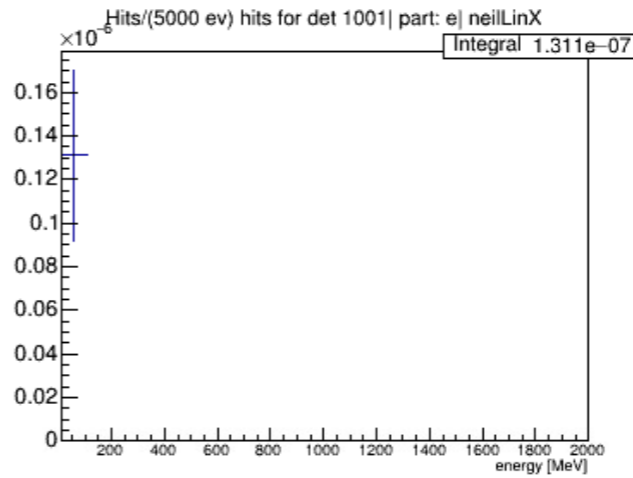
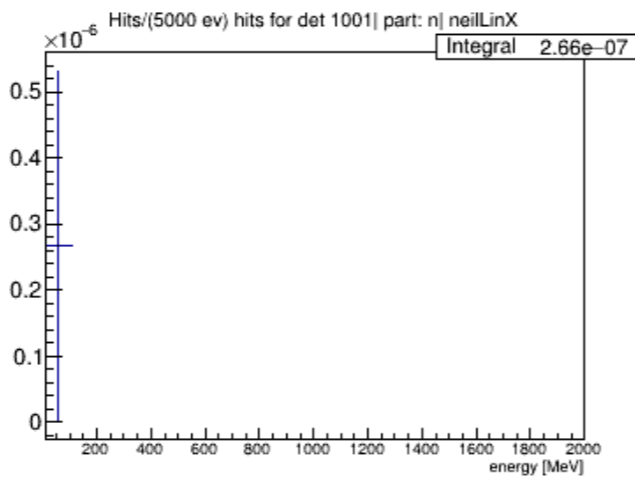
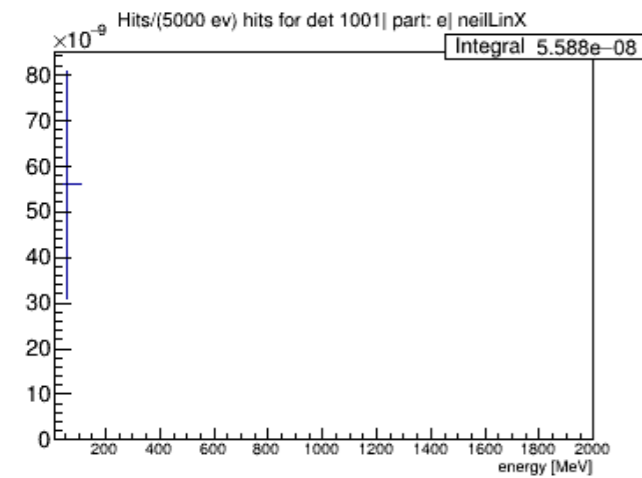
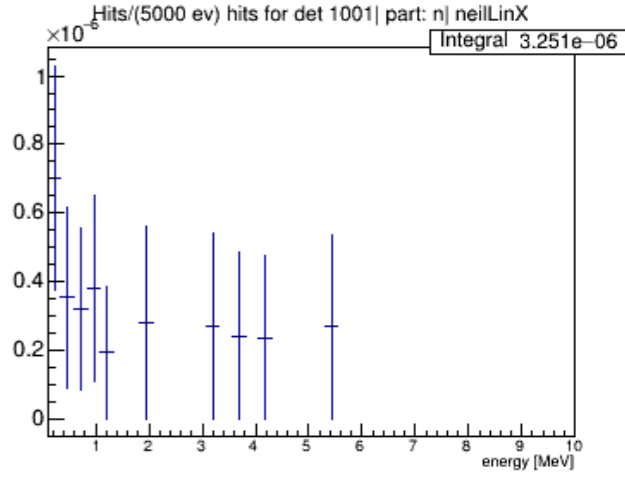
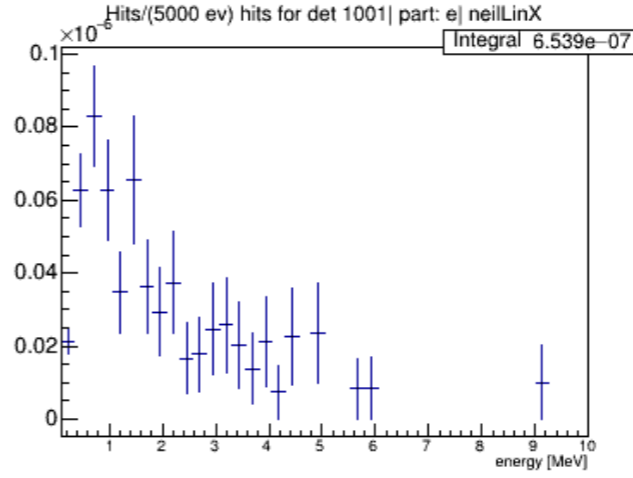
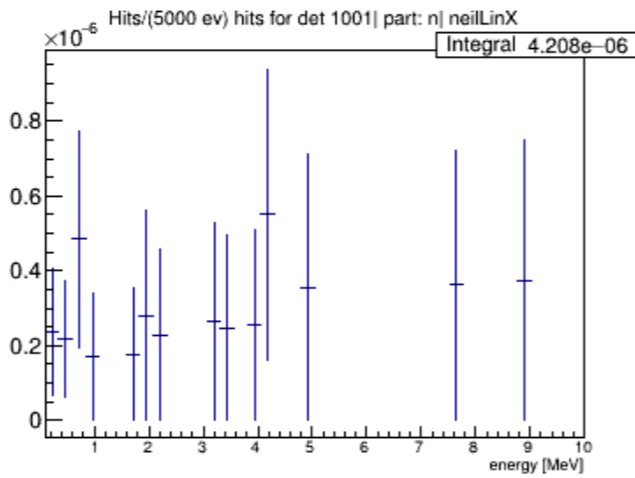
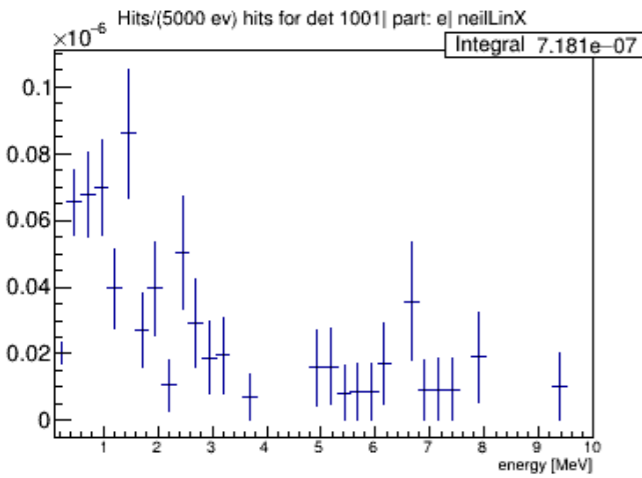
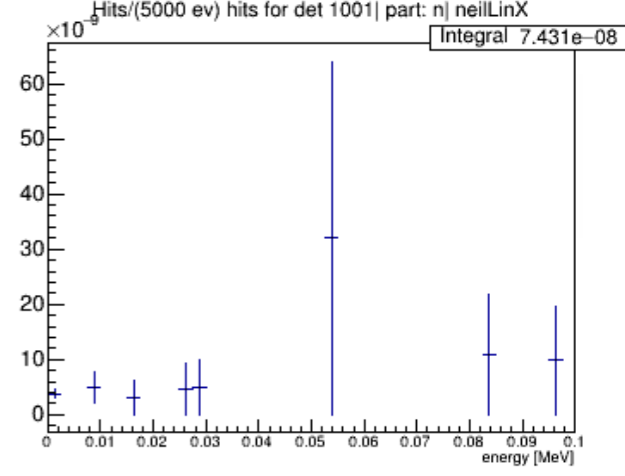
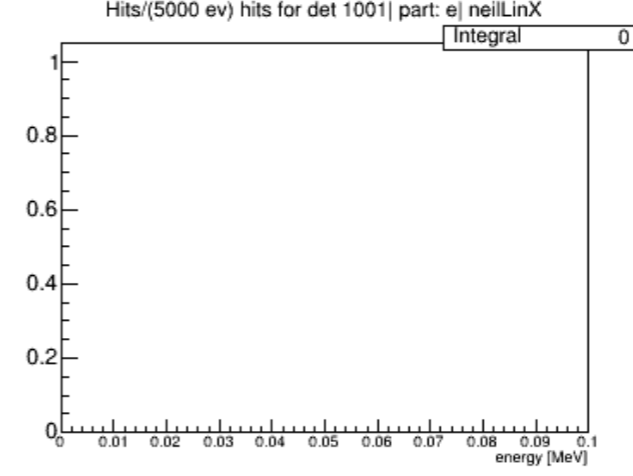
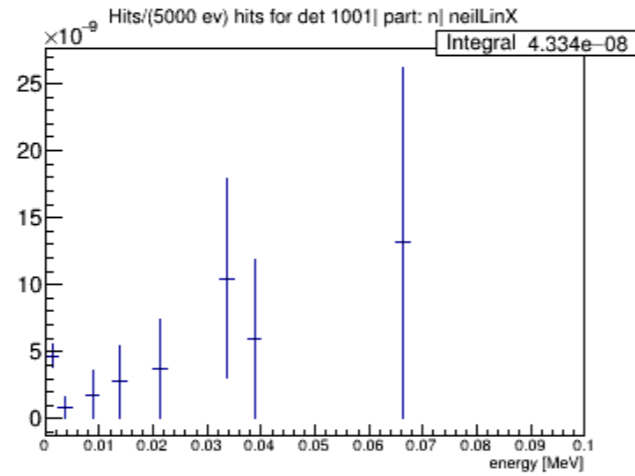
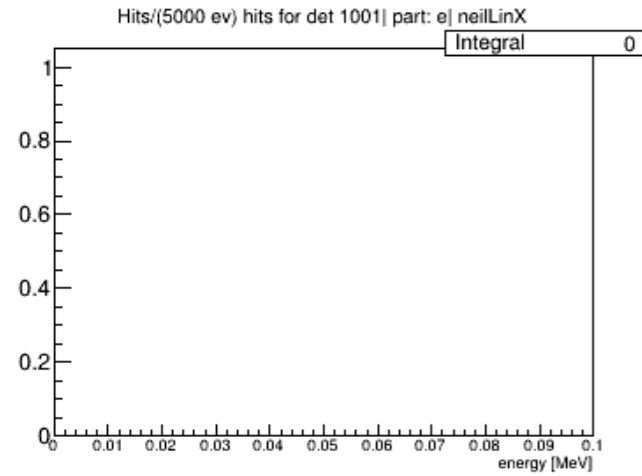
current setup



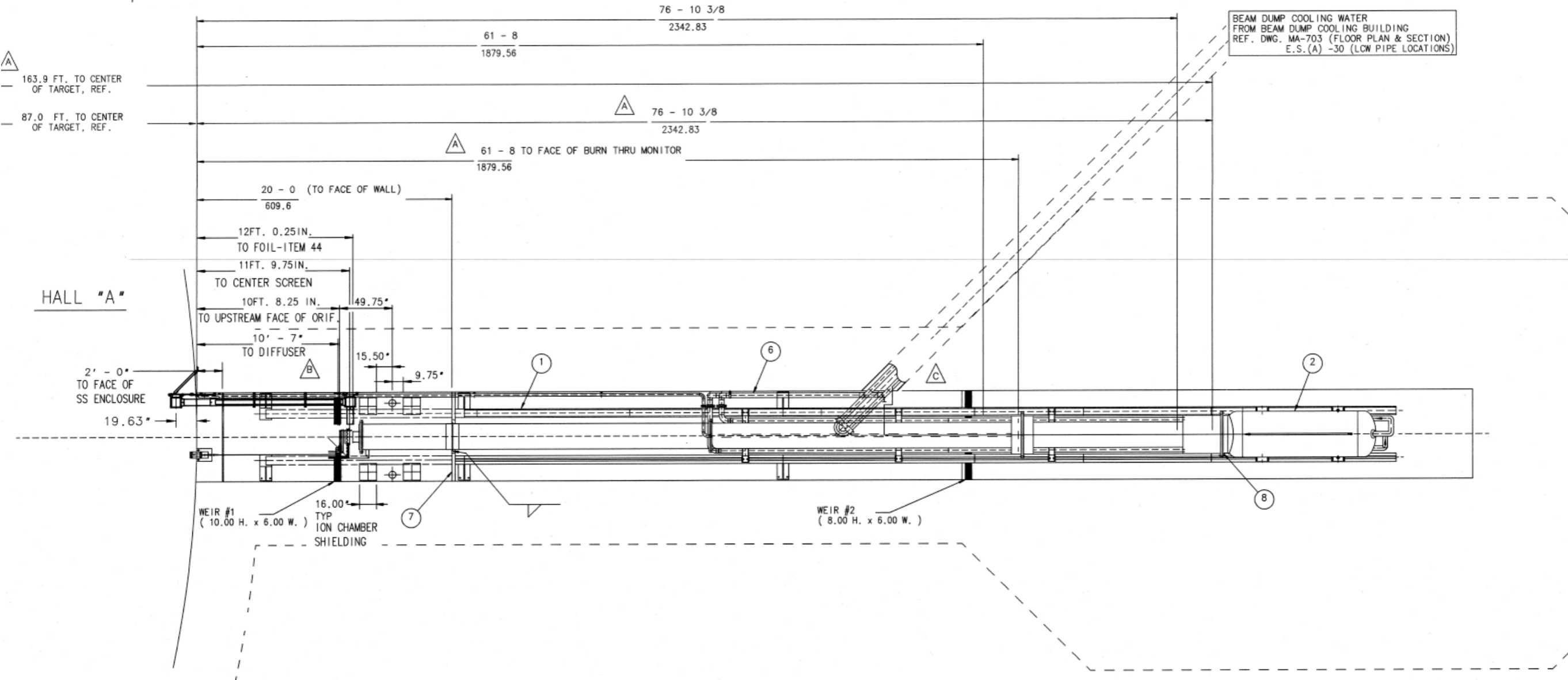
CREX - comparison

current setup

current setup + 2PipeSeptum+donut shield

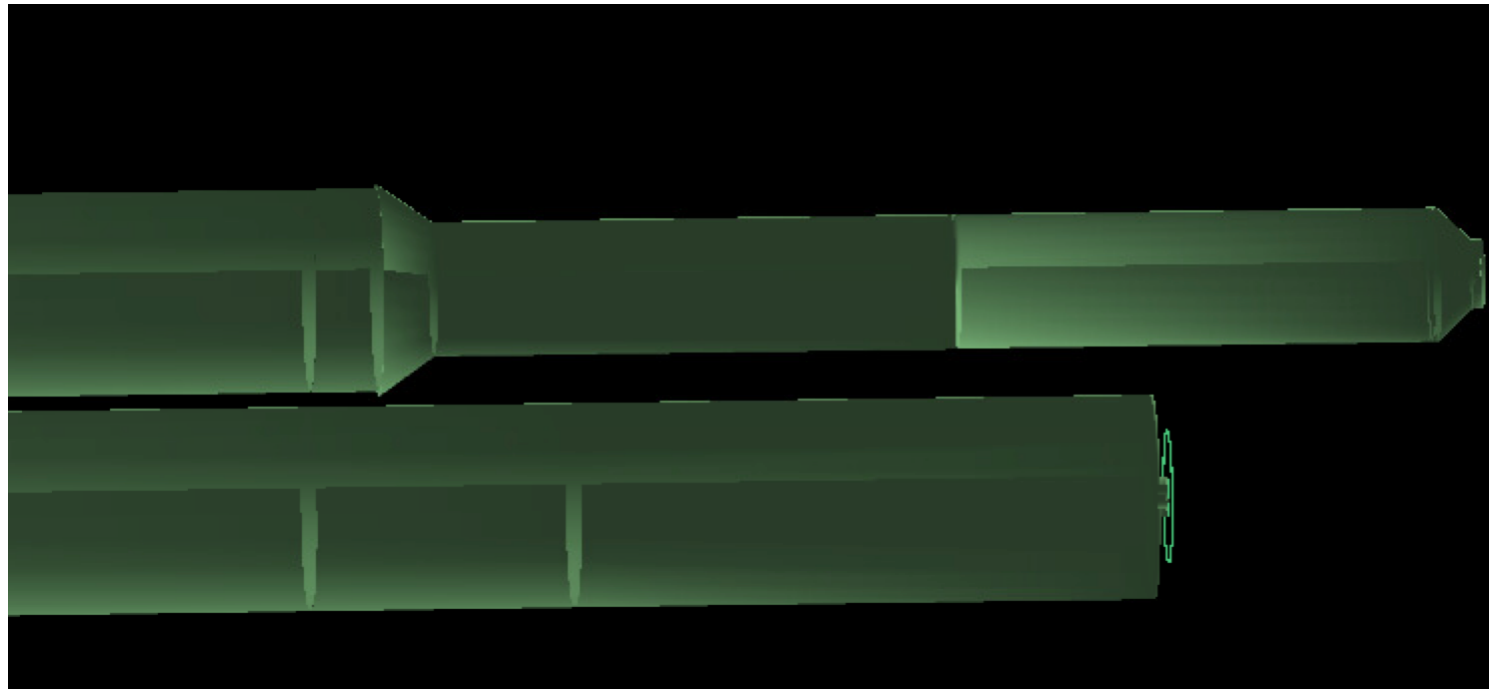


PREX 1 dump configuration

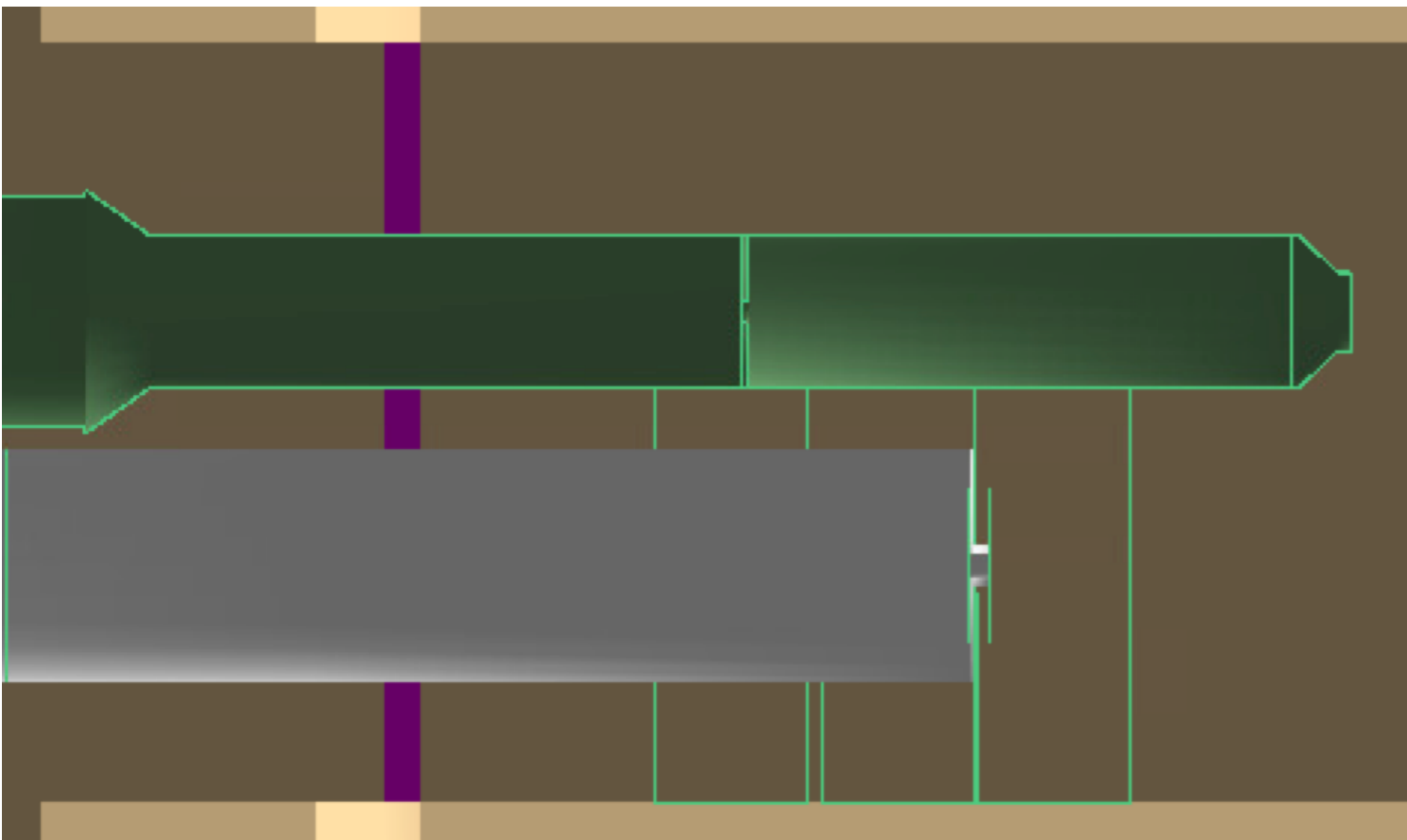


- Dump configuration was different than what we had in the simulation
- The beam pipe has an Aluminum aperture that is about 4in in diameter in about the same location as the donut is now

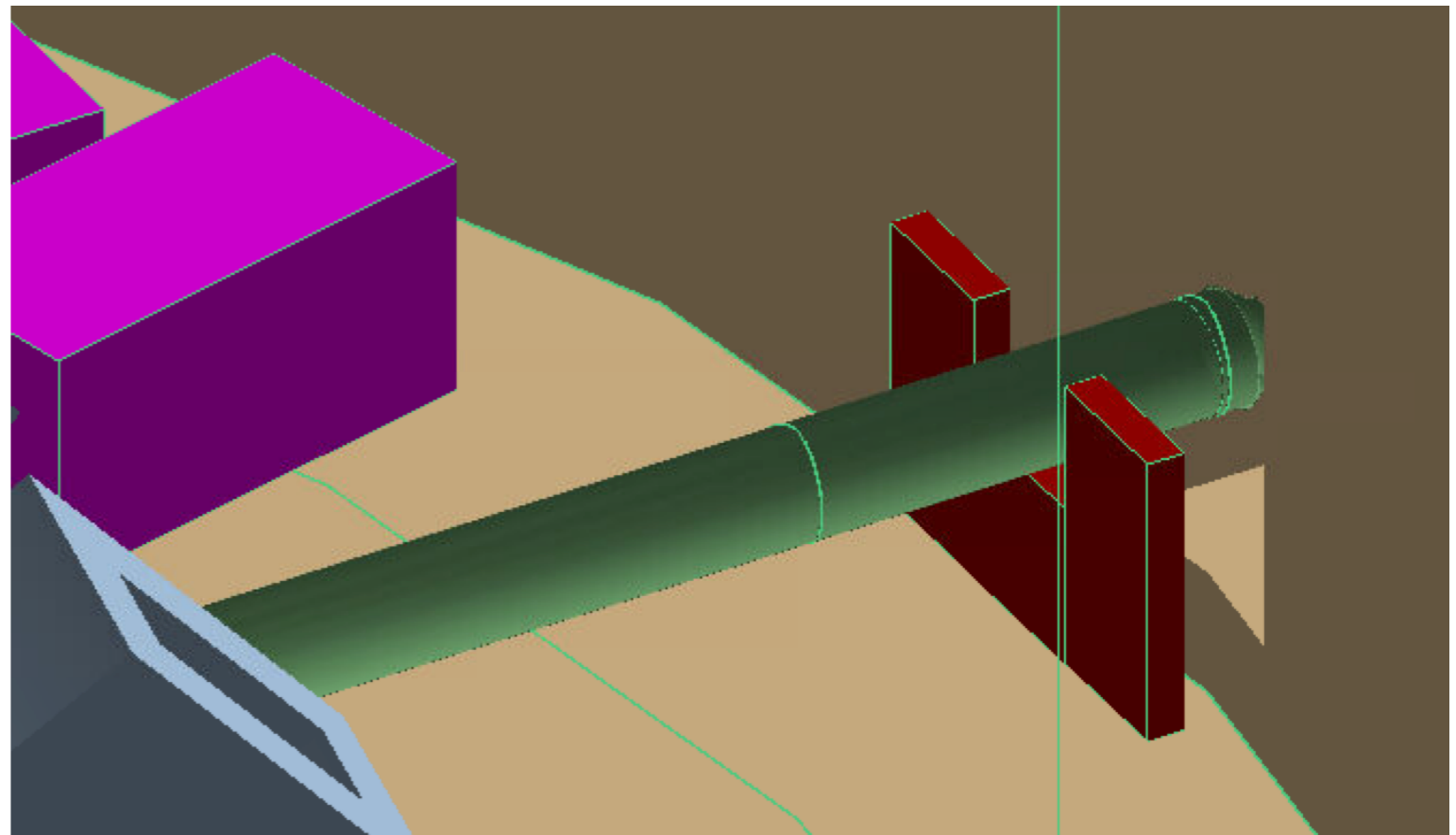
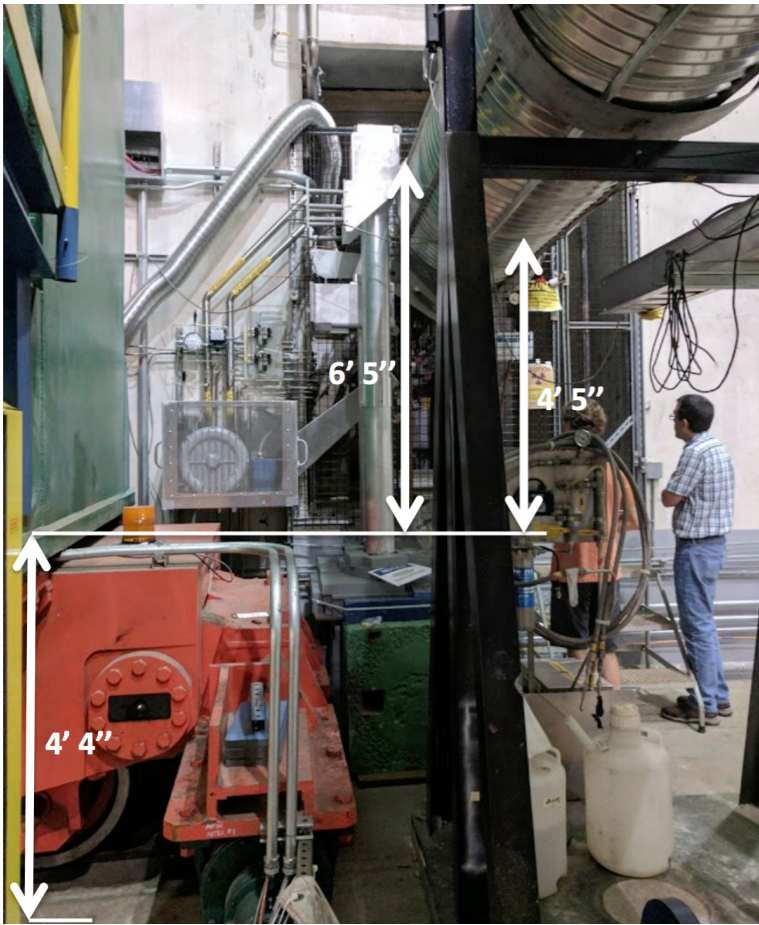
GDML implementation



- Furthermore Kent noticed that the neck down in my configuration didn't match the drawing (or reality)
- now the neck-down is right after the wall similarly to what we have in the hall

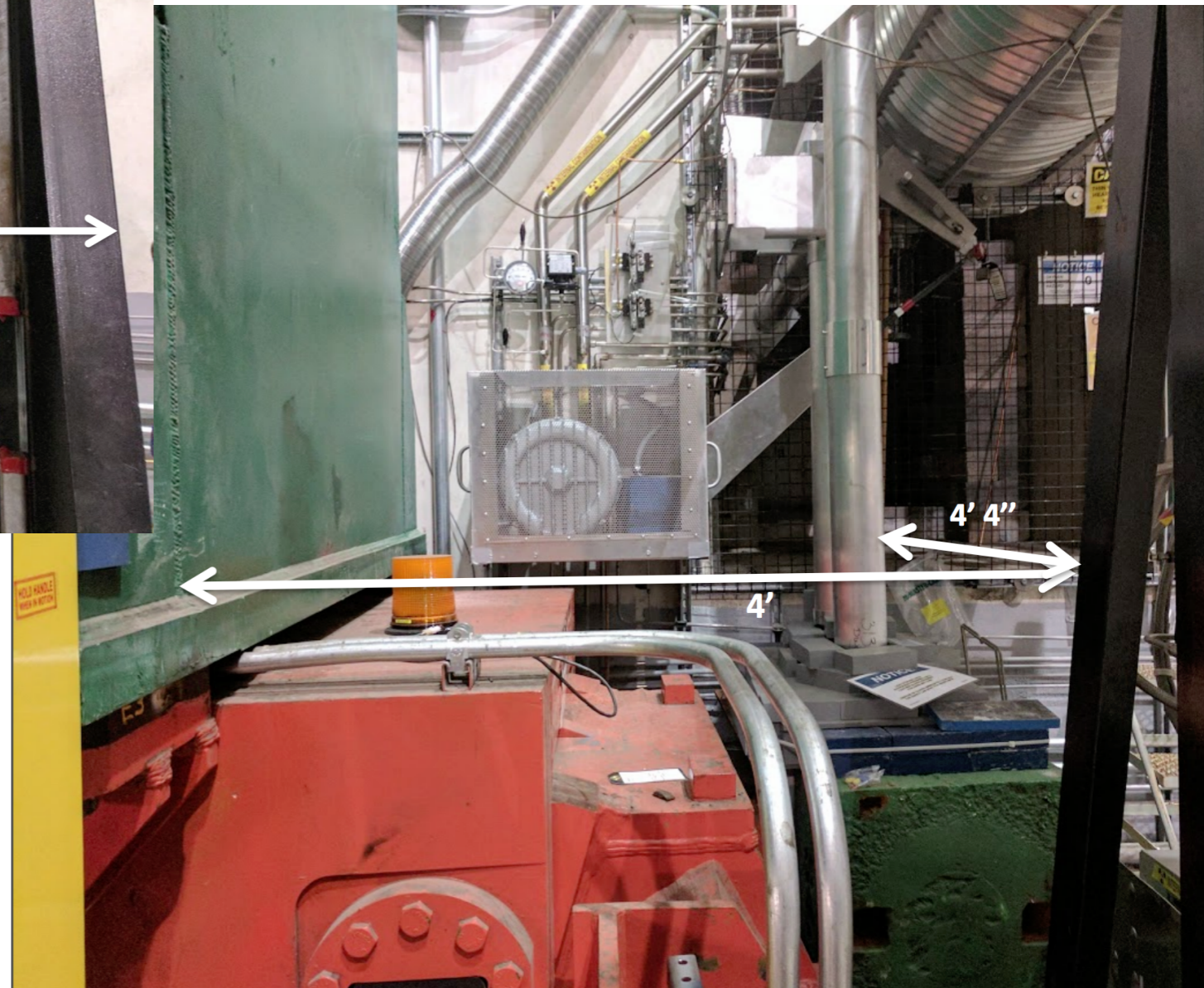
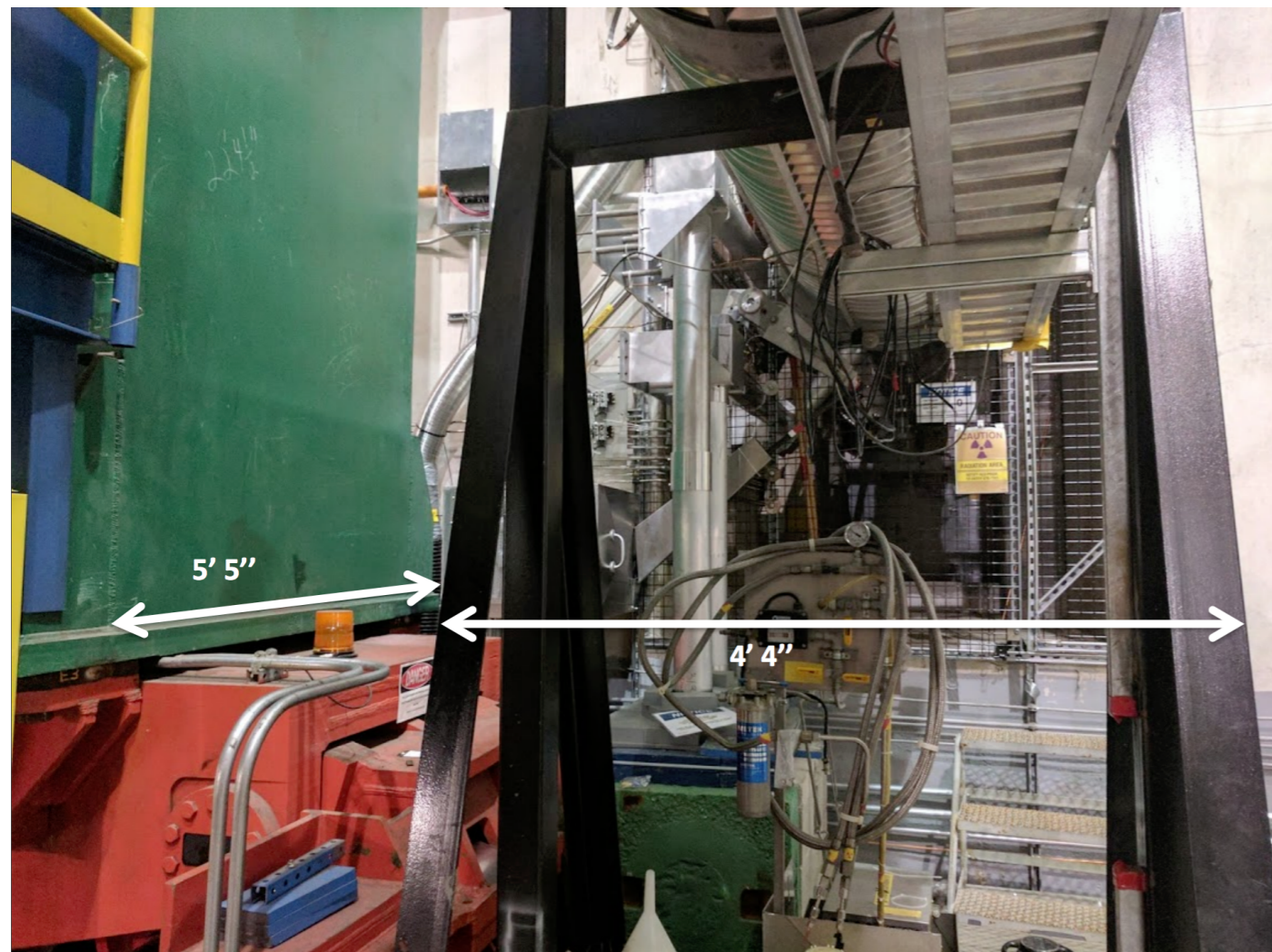


Shielding concept



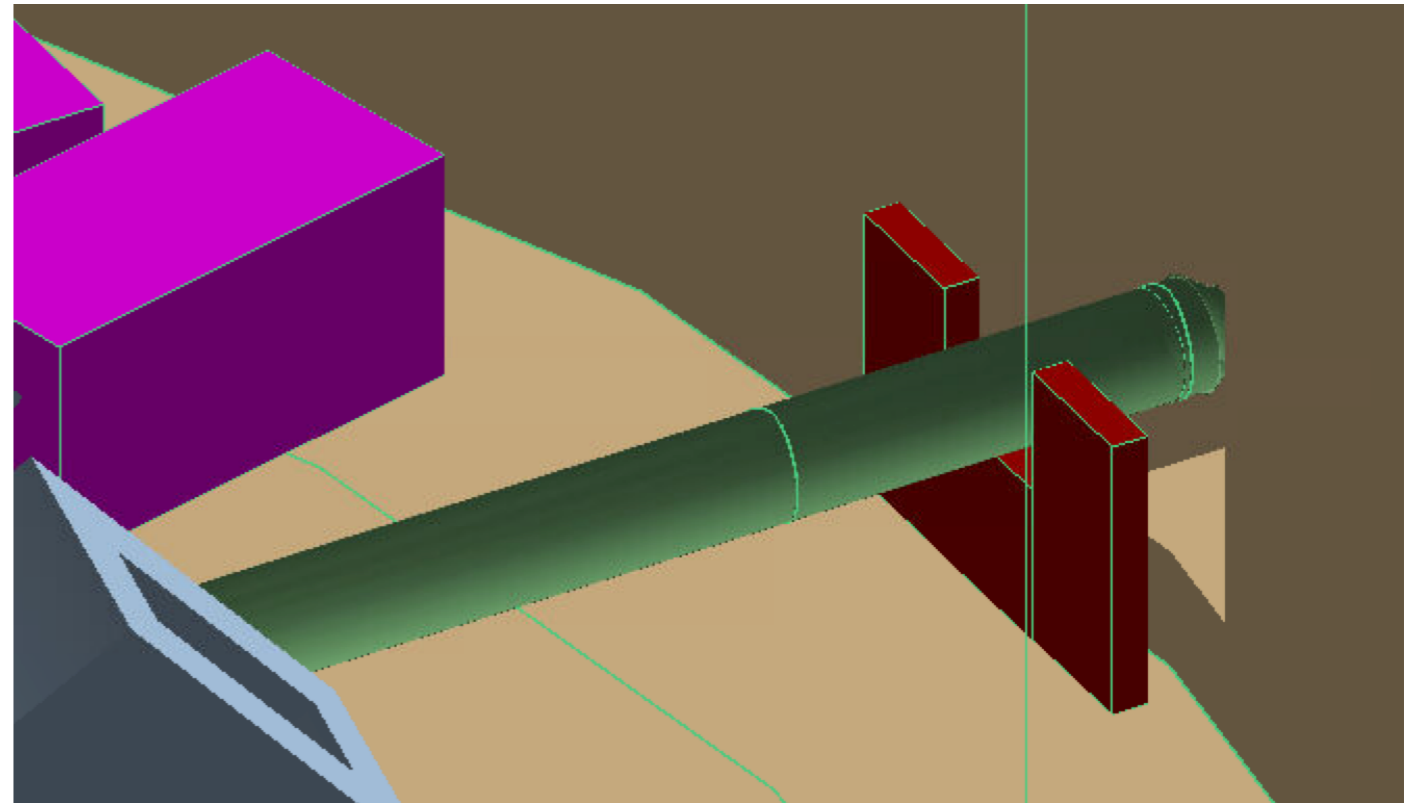
- Sanghwa, Dave and I went over to the hall and we made some measurement of the space available to us with the HRS parked in the 12.5 deg position
- I implemented 3 simple 1 foot thick shielding blocks in the simulation (ran for both concrete and Polyethylene)

Hall Configuration



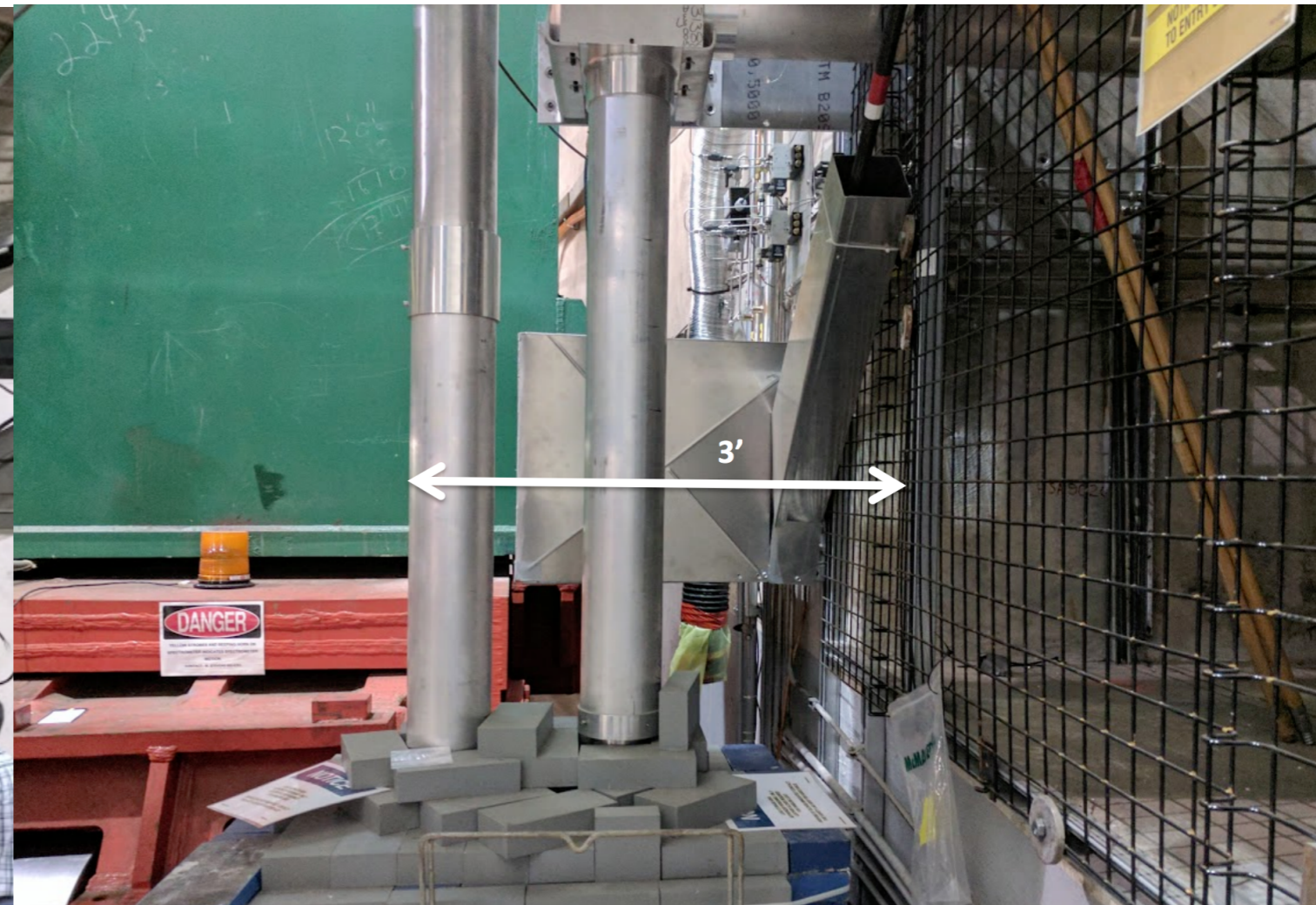
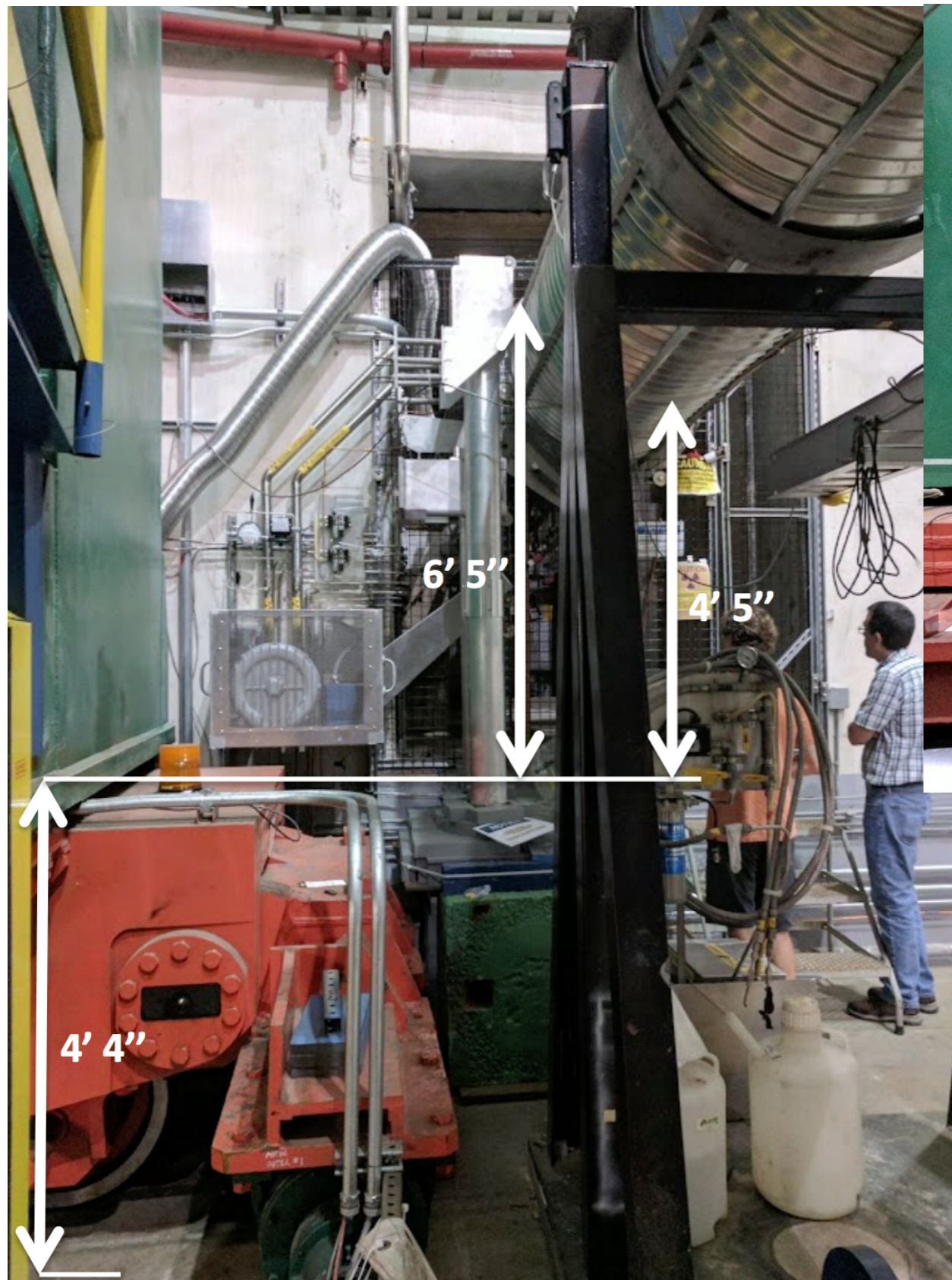
- 10 cm thick Steel wall (in green) is not present in our simulation

Hall Configuration



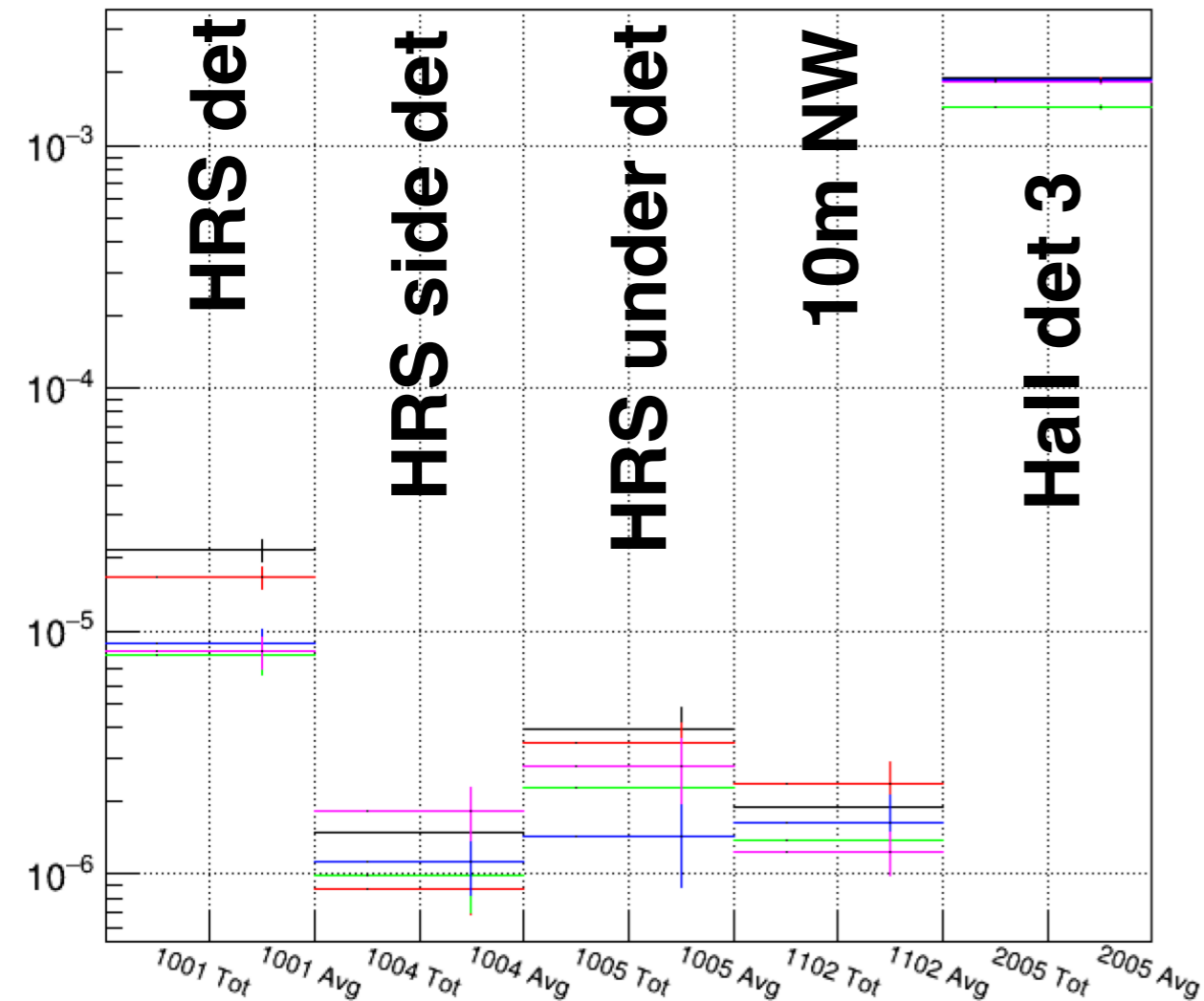
- 10 cm thick Steel wall (in green) is not present in our simulation
- moreover, the hrs “electronics box” we have now doesn’t cover the whole area where electronics exist and may be too forward

Hall Configuration



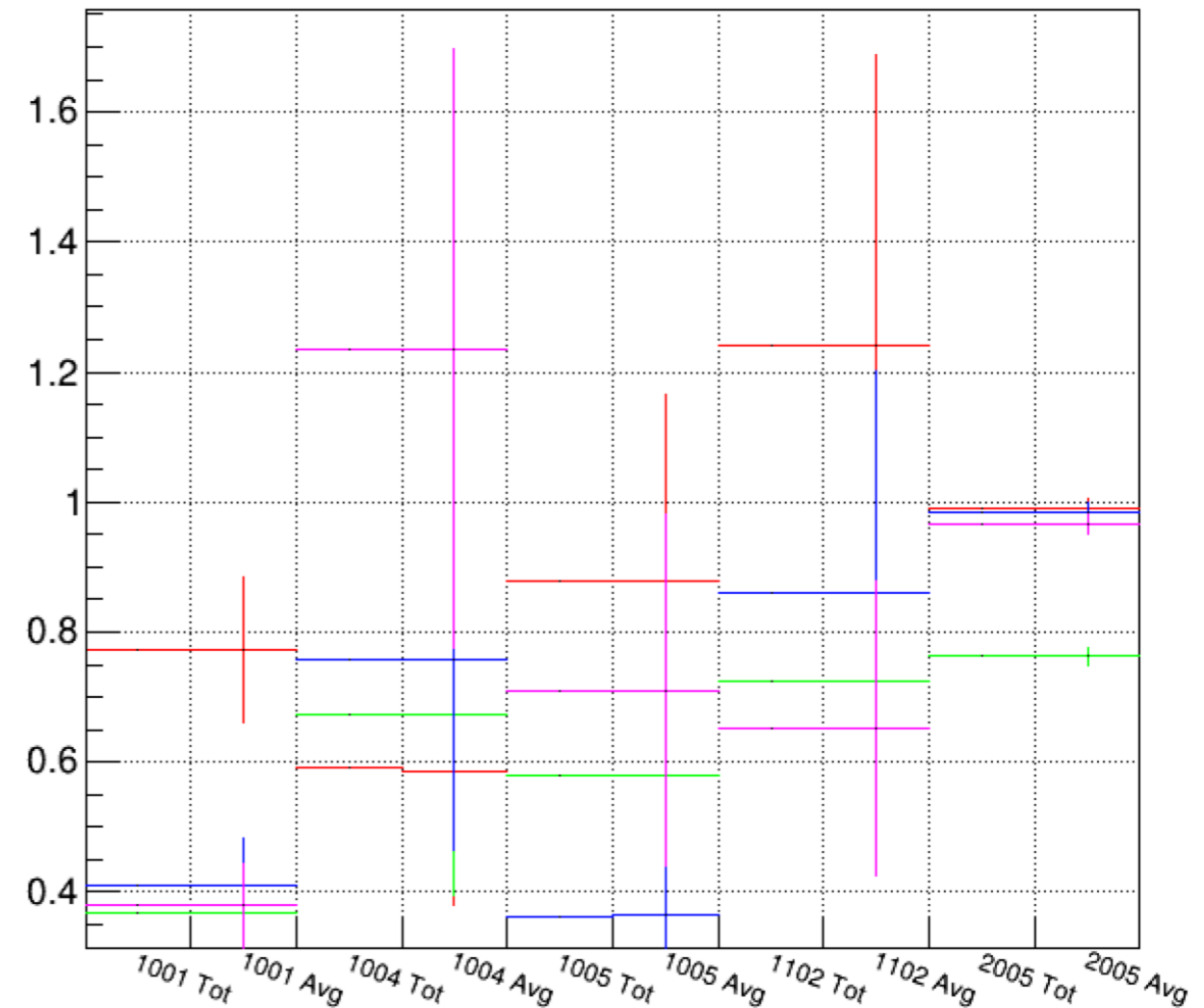
PREX2 - HRS rad damage

summary histogram per electron on target| neilLogX



Black: current setup
Red: current setup + 4 in donut
Green: PREX 1 dump
Blue: current setup + concrete Shield
Magenta: current setup + Poly Shield

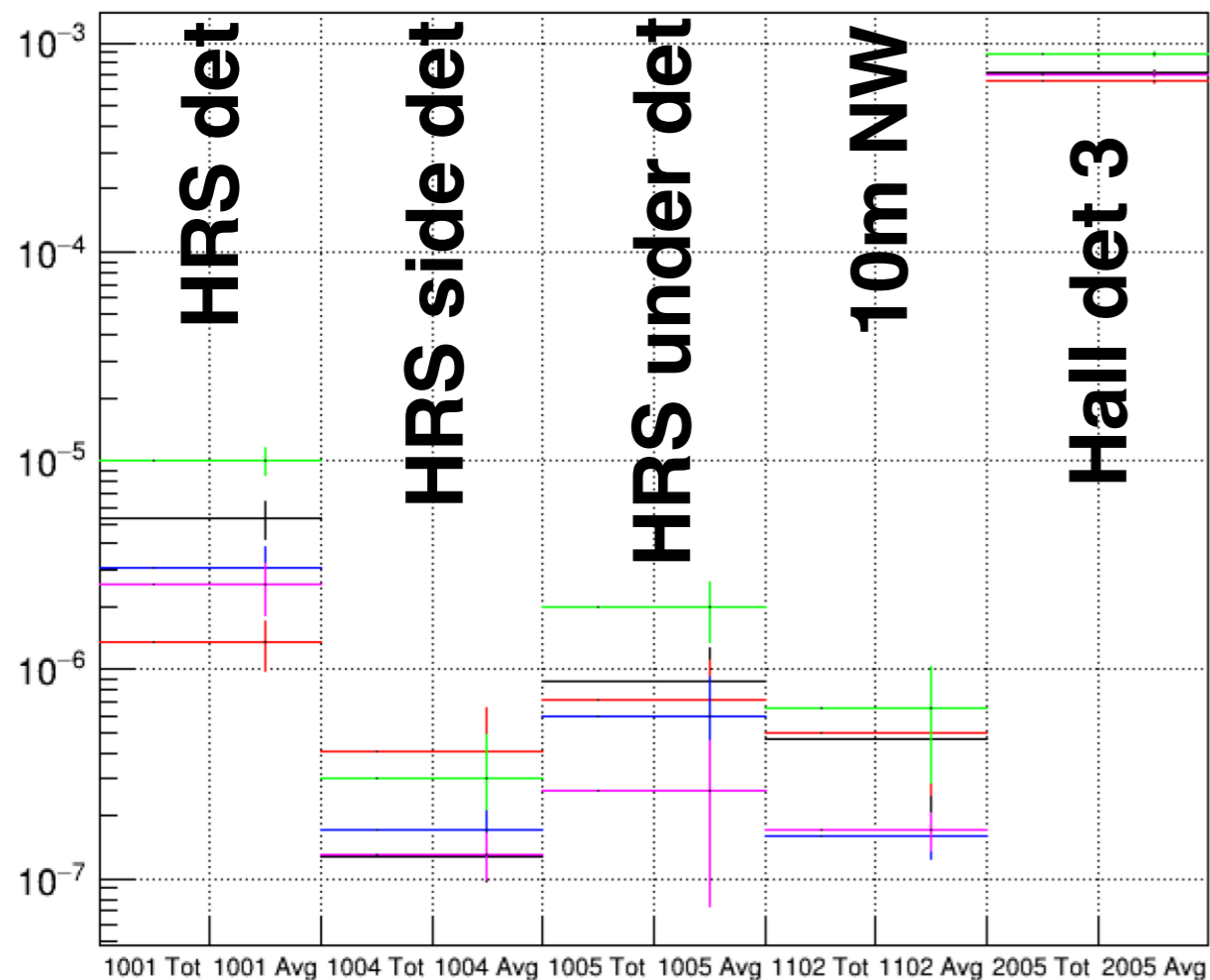
summary histogram per electron on target| neilLogX



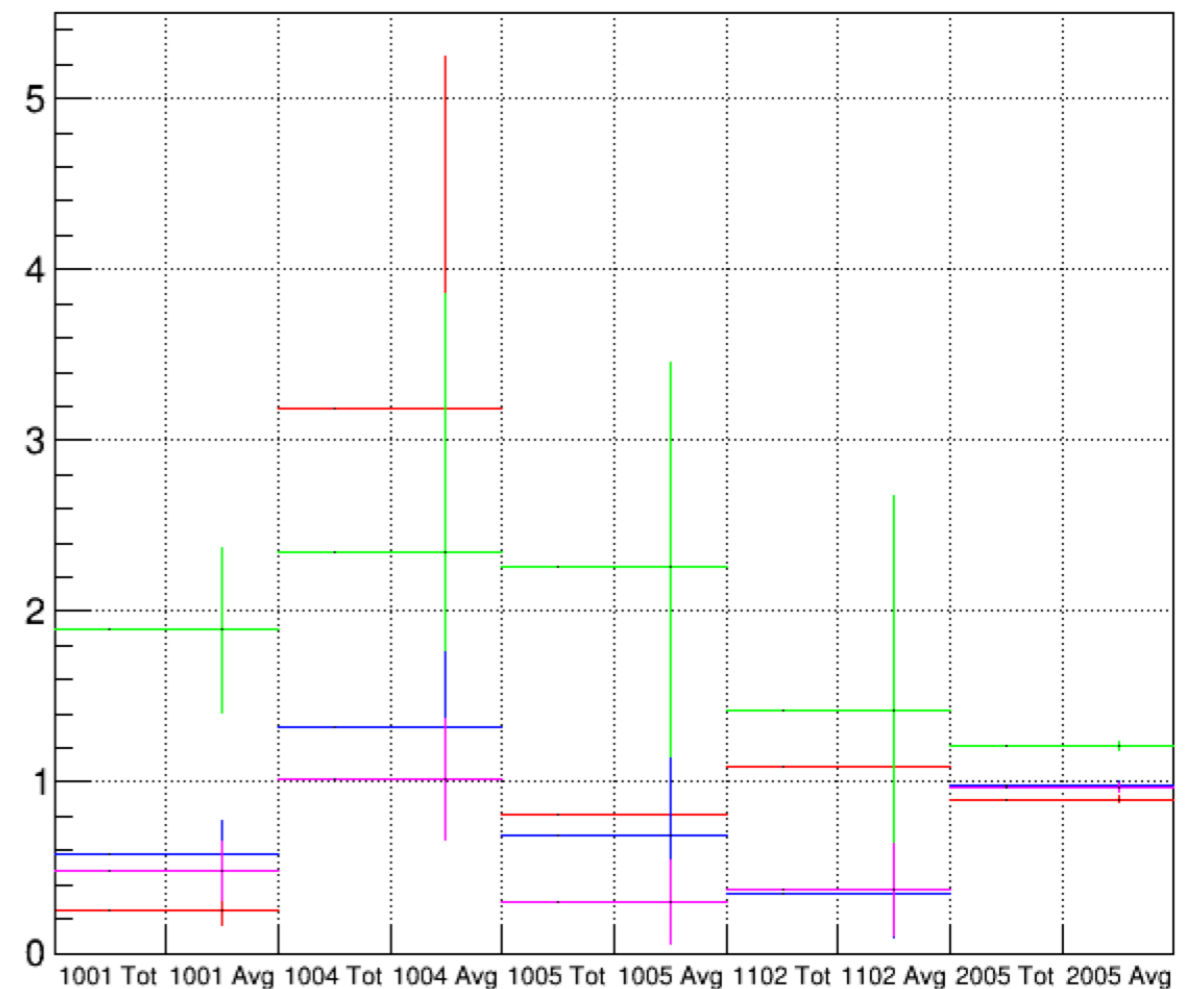
- Best configuration seems to be the PREX1 beam pipe, followed closely by the current pipe with shielding

CREX - HRS rad damage

summary histogram per electron on target| neilLogX



summary histogram per electron on target| neilLogX



Black: current setup

Red: current setup + 4 in donut

Green: PREX 1 dump

Blue: current setup + concrete Shield

Magenta: current setup + Poly Shield

- For CREX having a large aperture can provide significant improvement

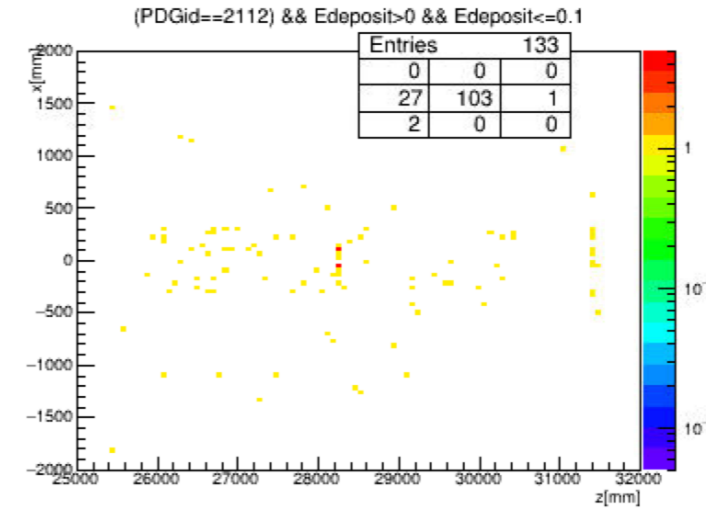
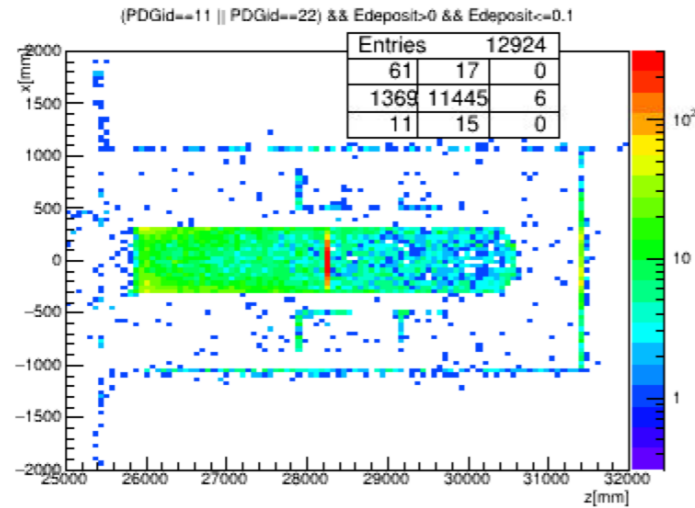
Plots with electrons plus gammas

PREX2 - current dump

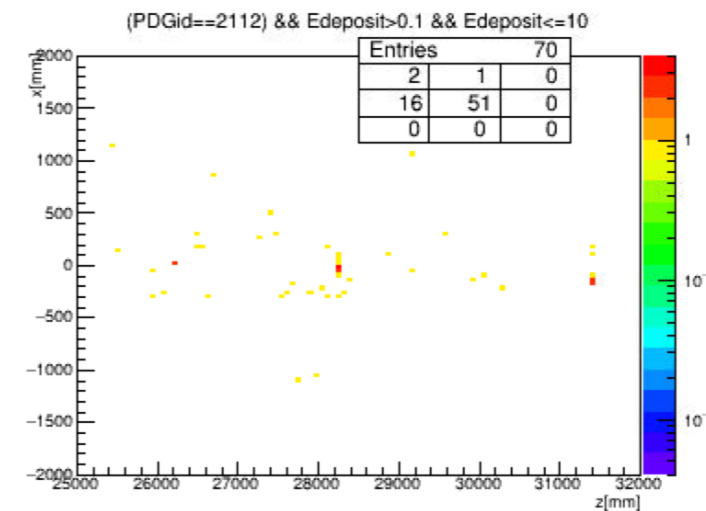
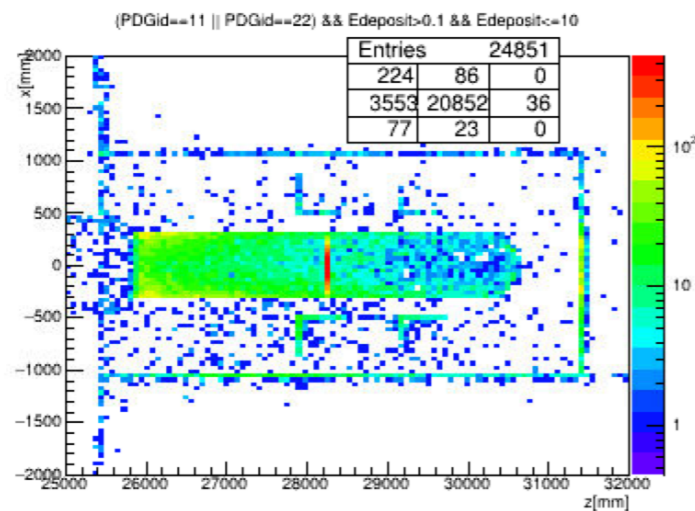
electrons+photons

neutrons

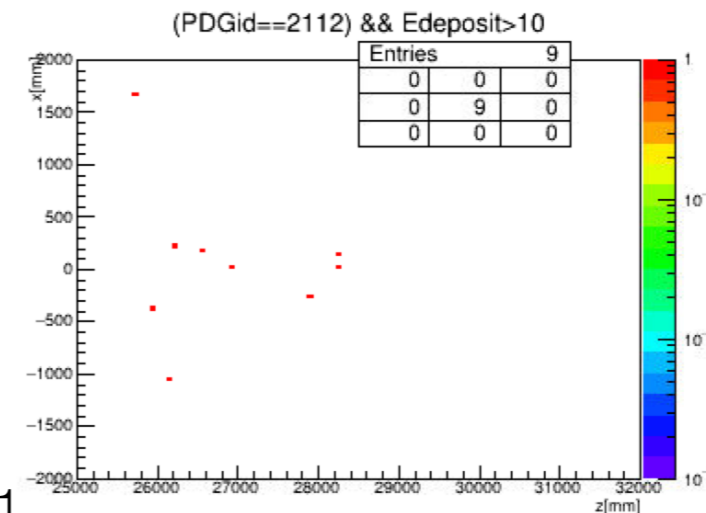
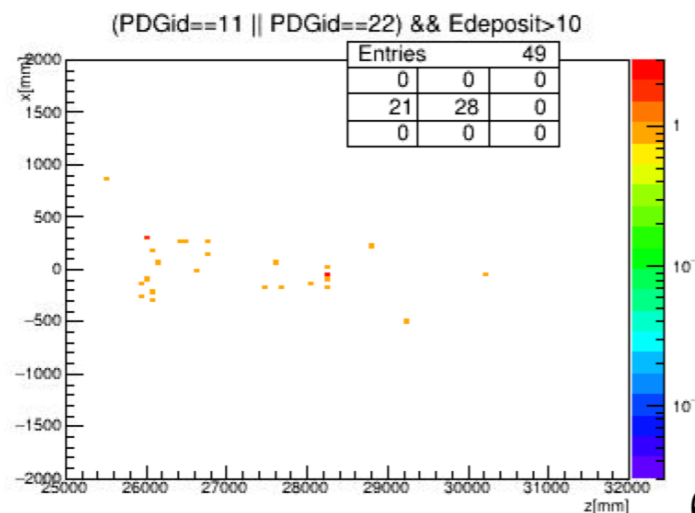
$0 < E \leq 0.1$ MeV



$0.1 < E \leq 10$ MeV

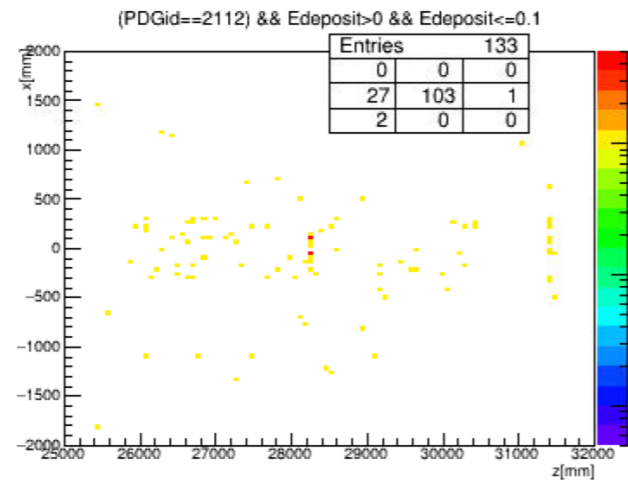
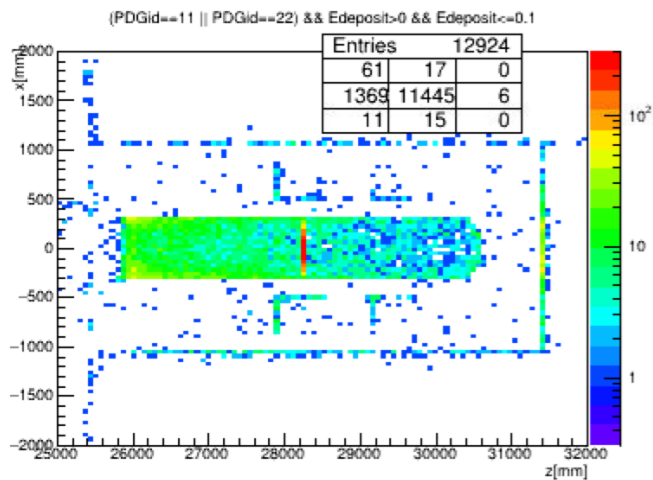


$10 < E$ MeV

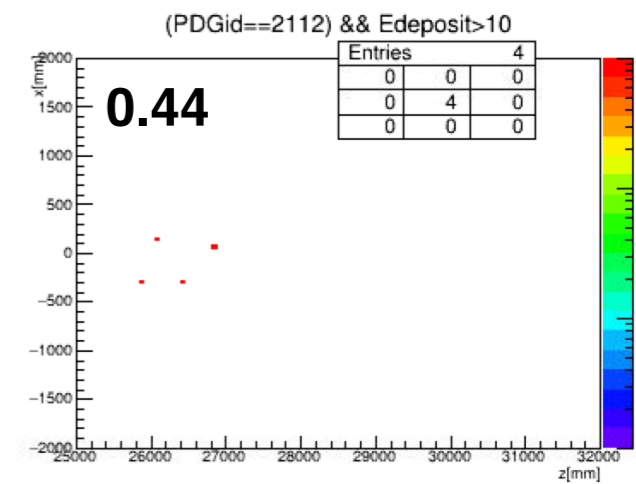
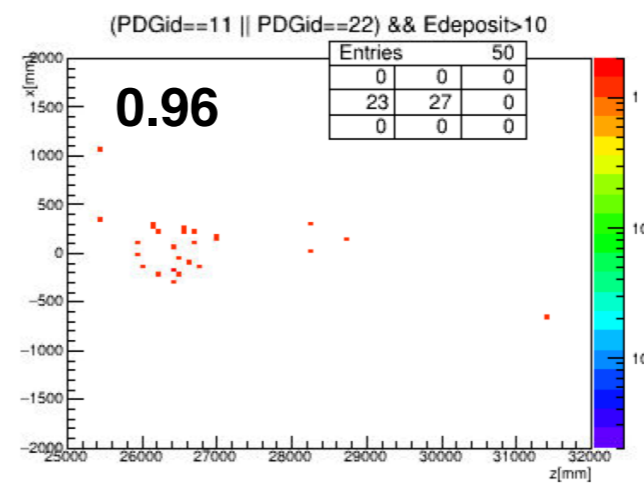
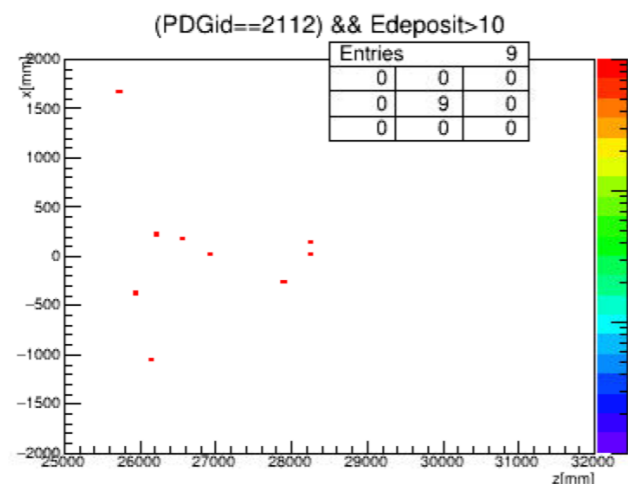
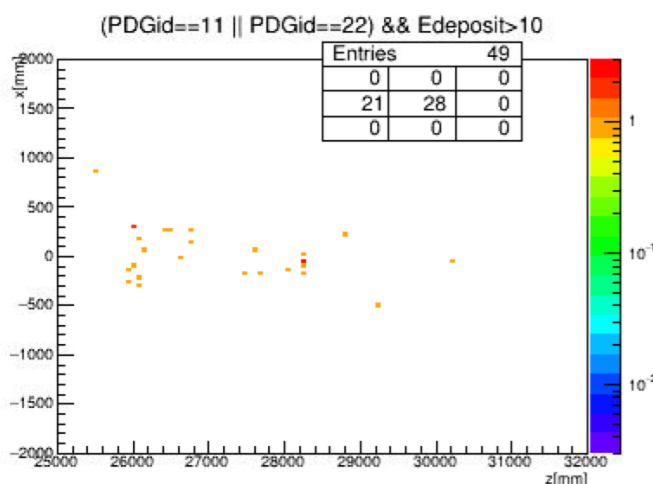
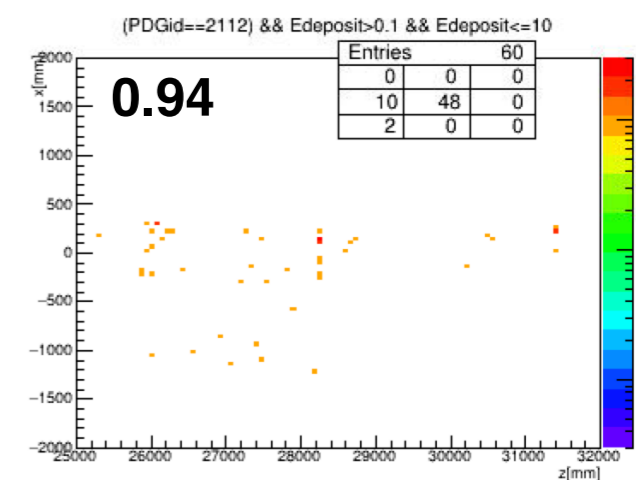
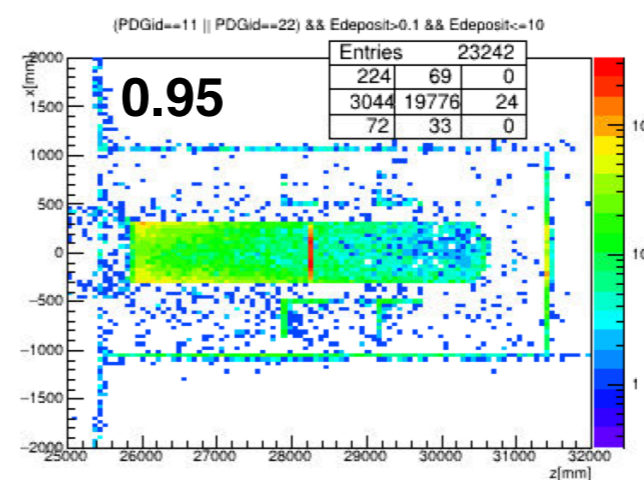
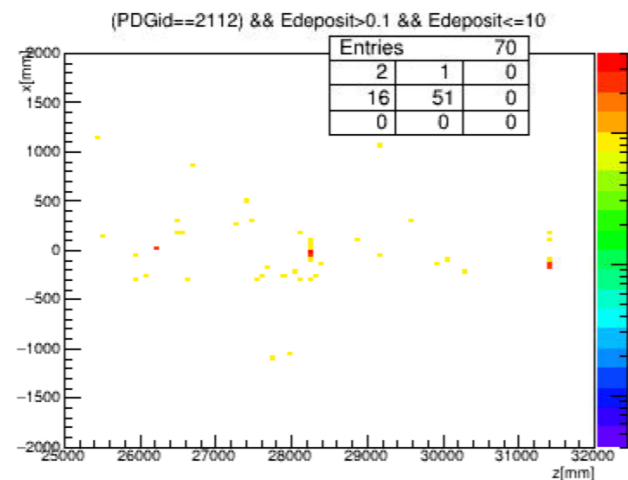
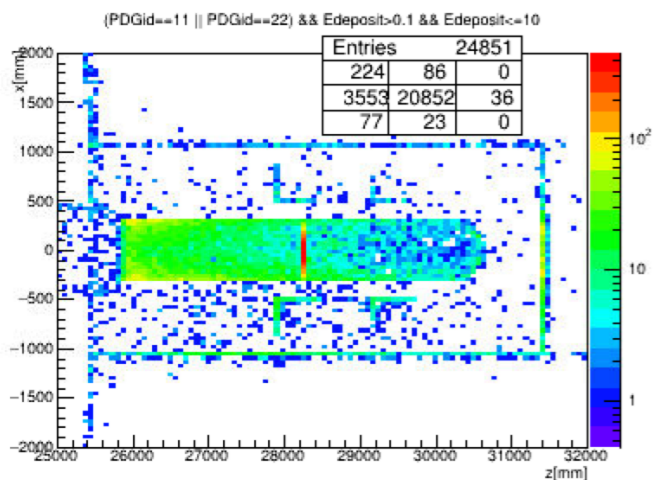
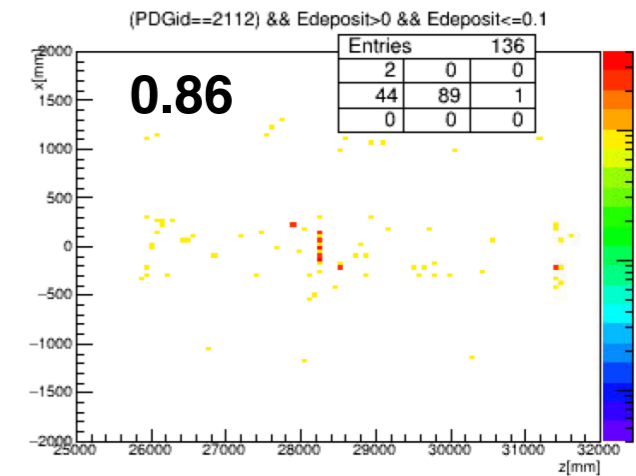
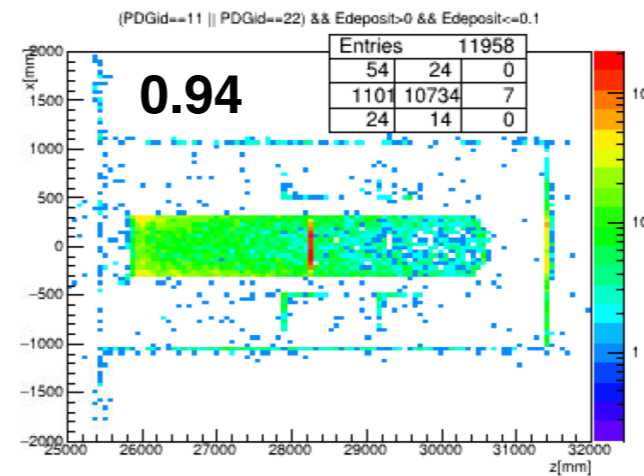


PREX2 - comparison

current setup

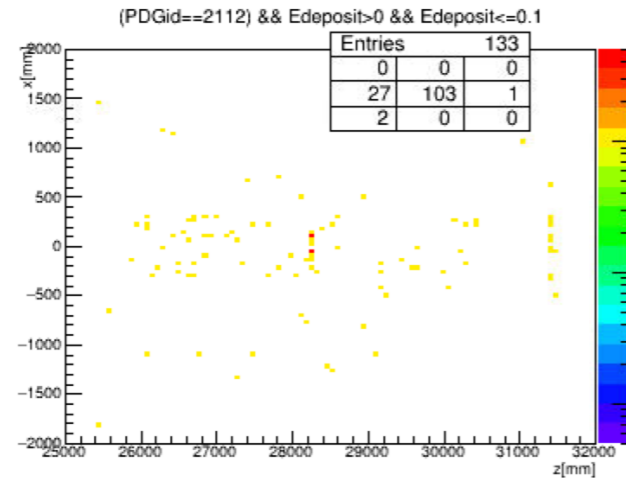
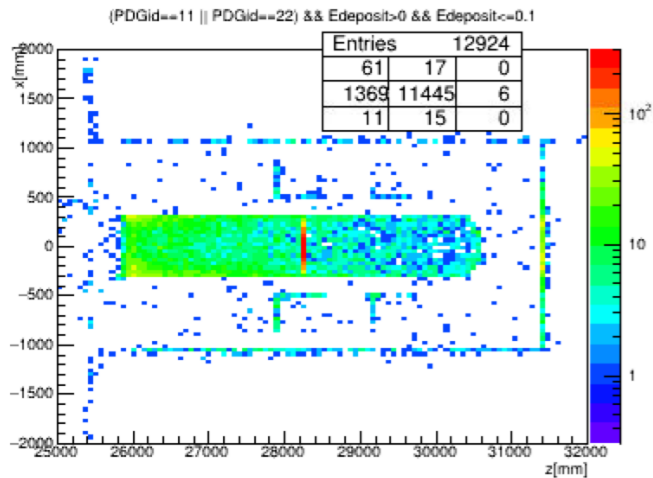


current setup + 4 in donut

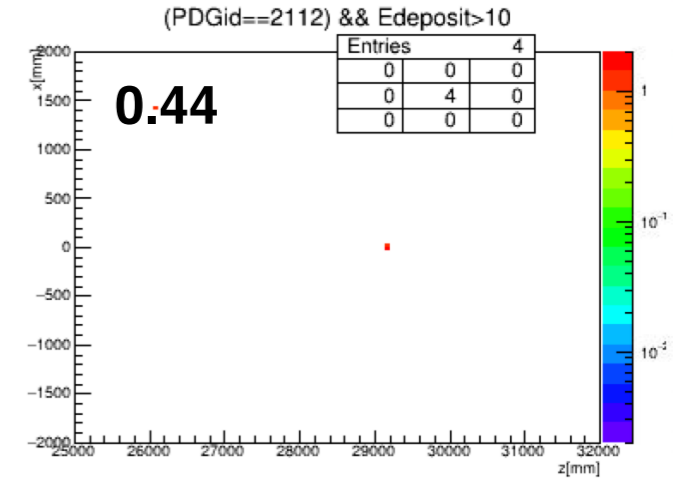
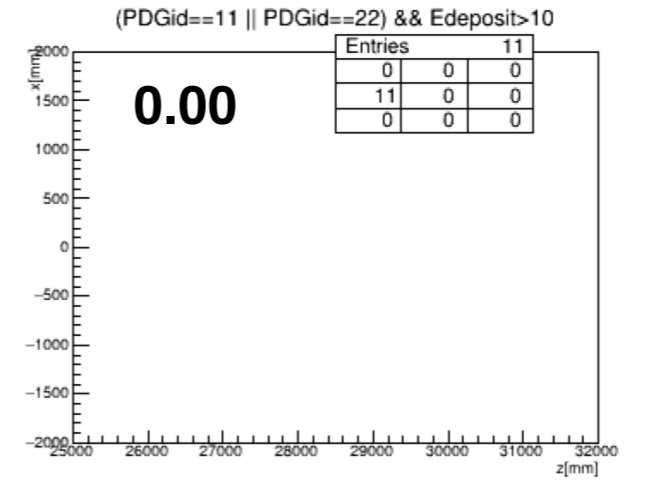
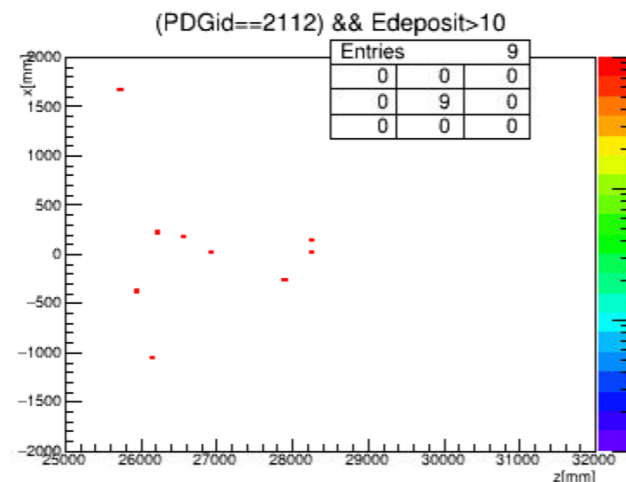
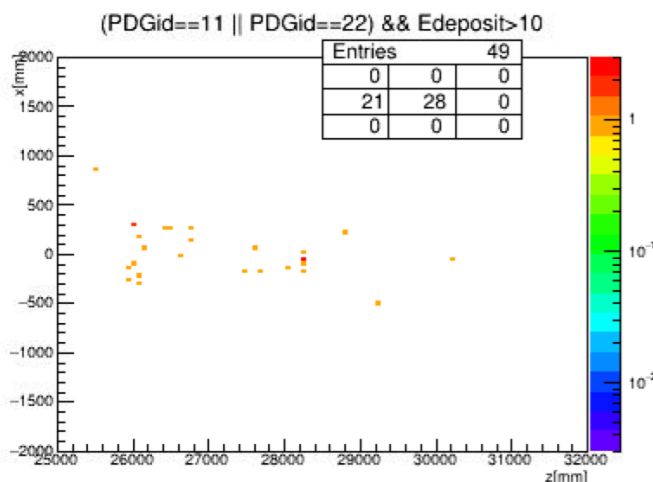
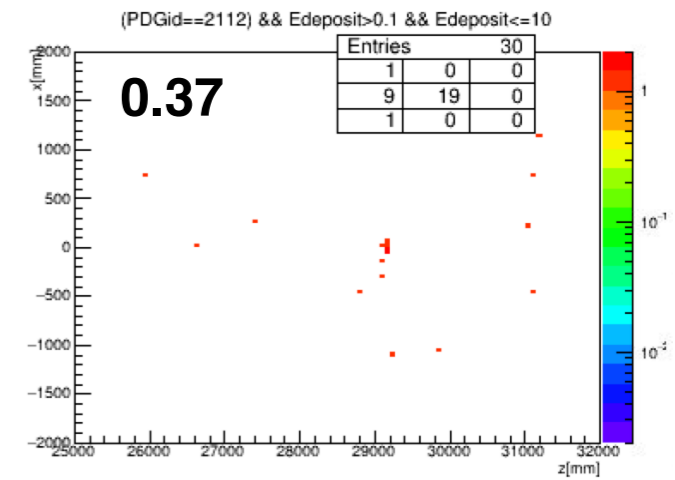
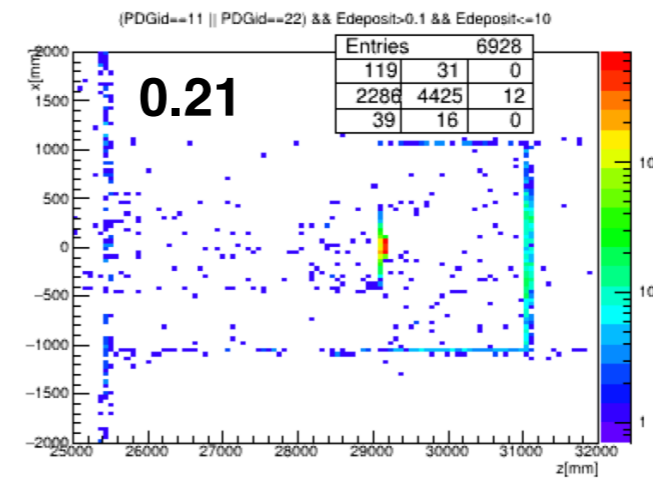
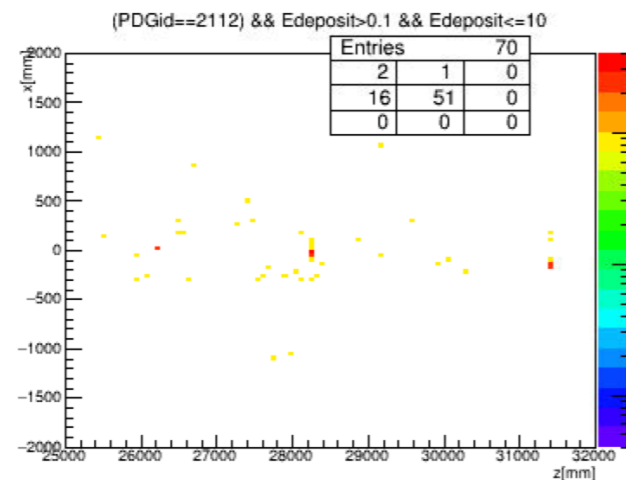
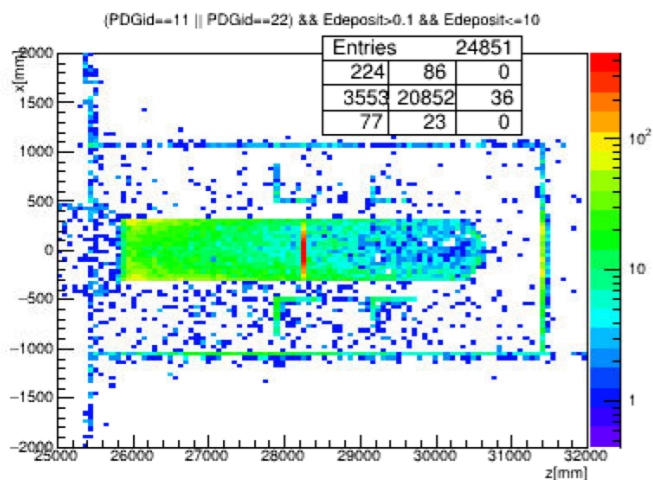
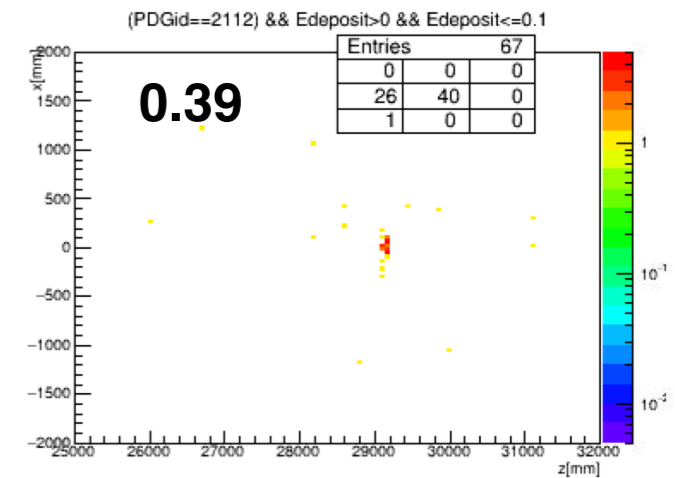
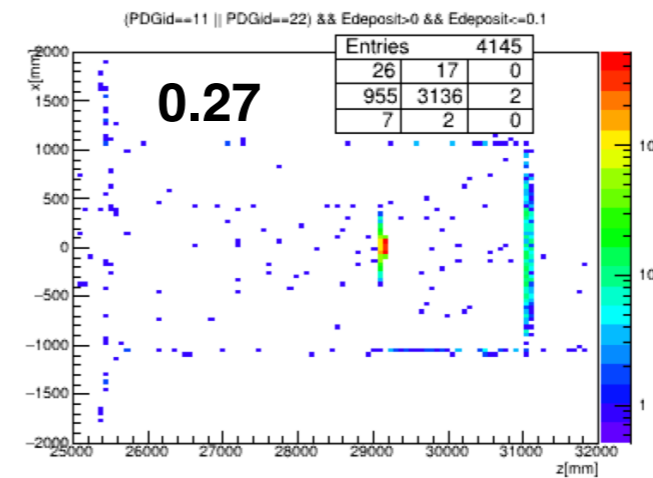


PREX2 - comparison

current setup

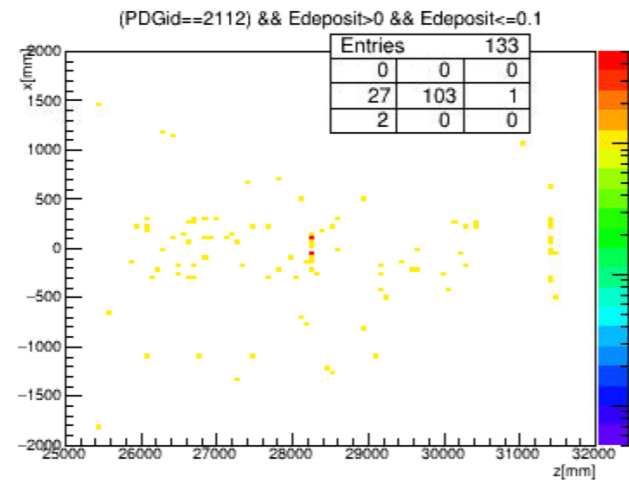
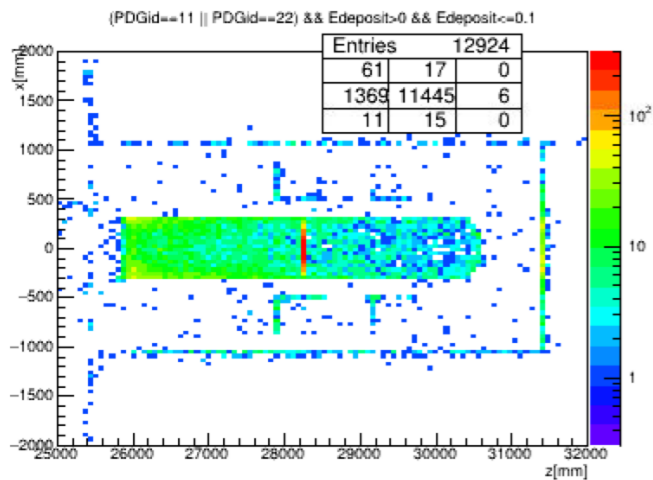


PREX1 dump configuration

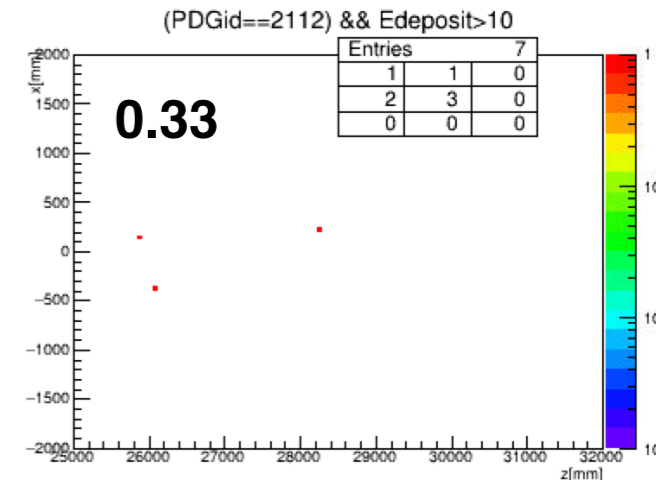
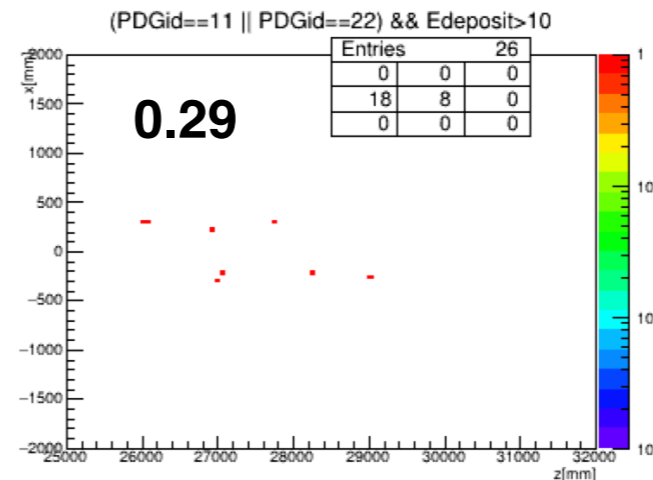
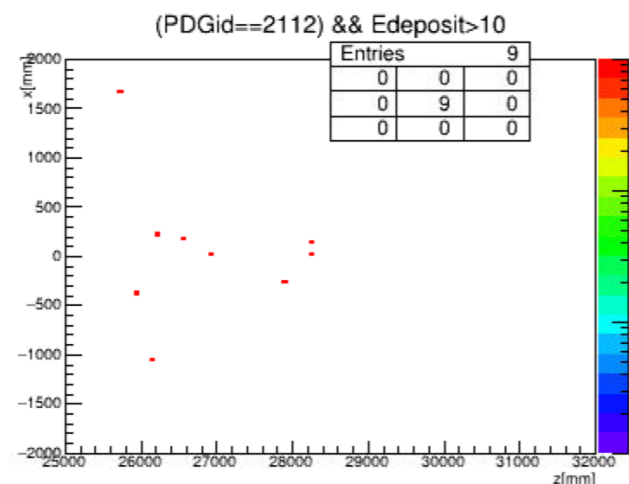
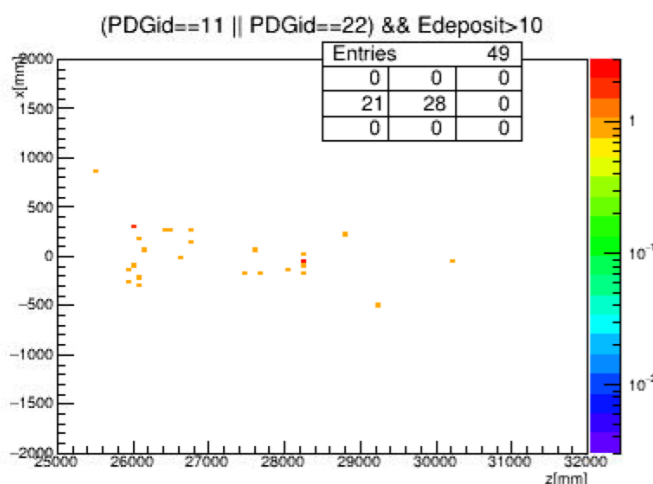
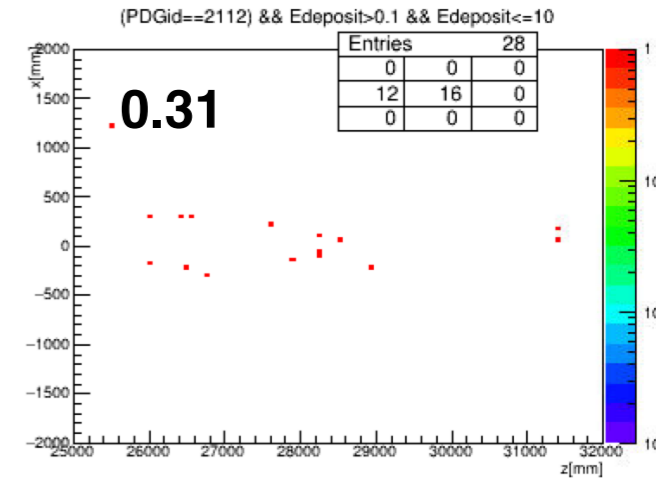
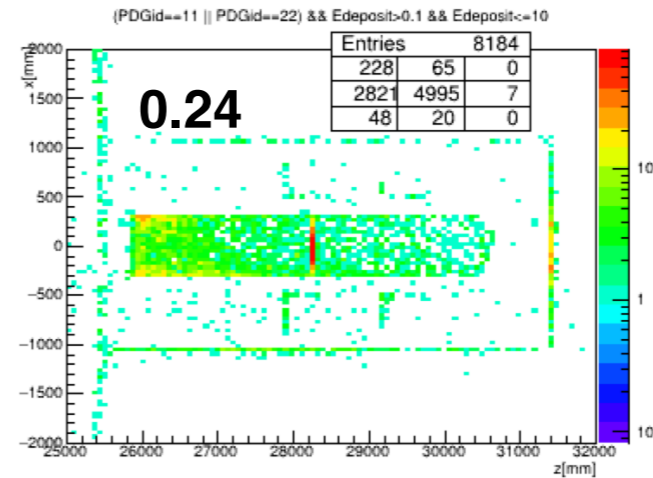
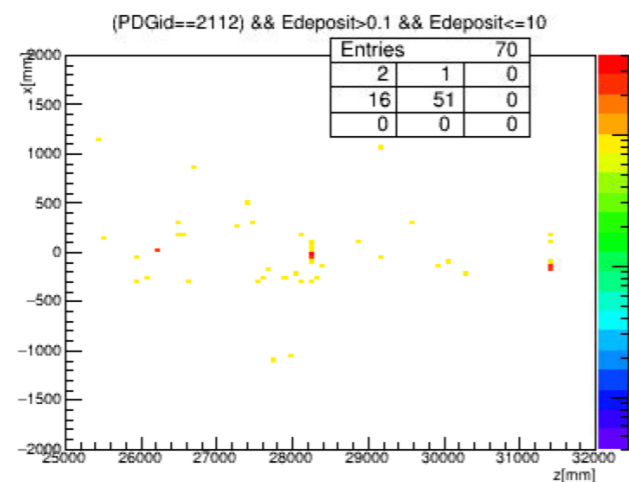
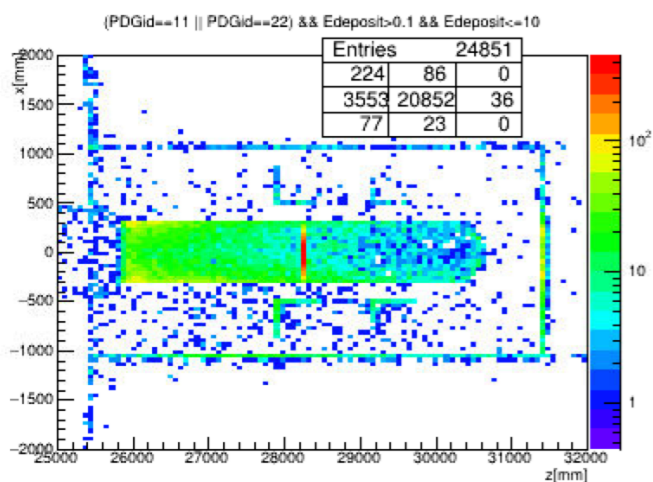
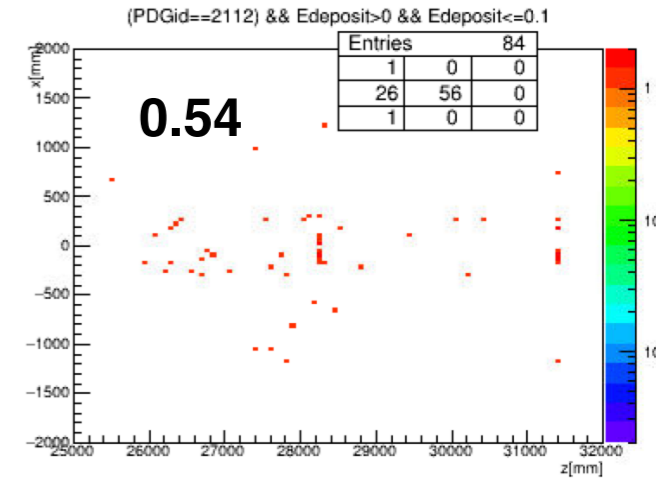
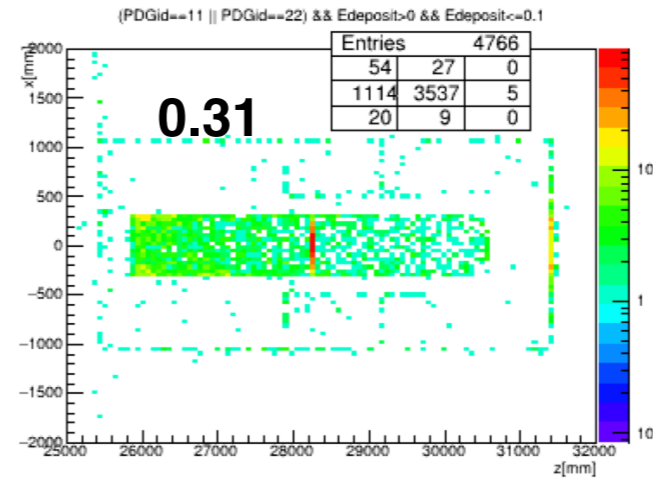


PREX2 - comparison

current setup

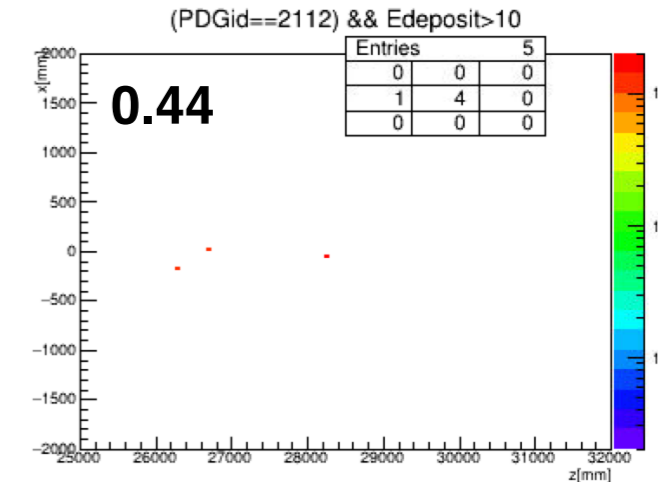
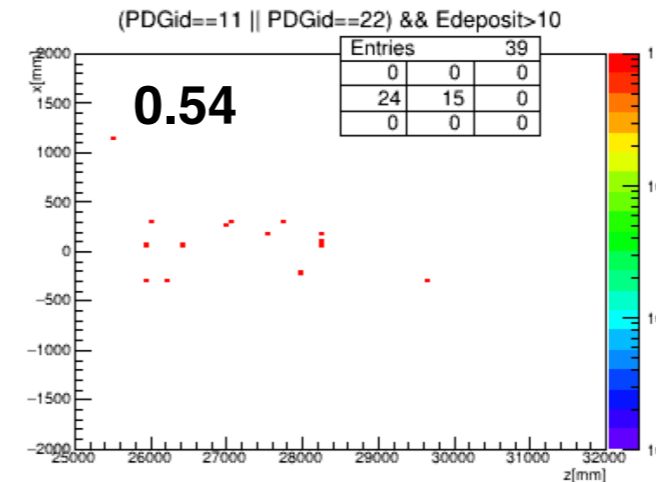
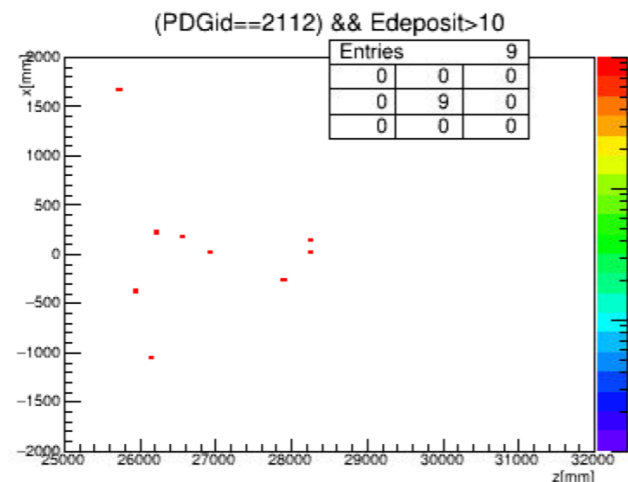
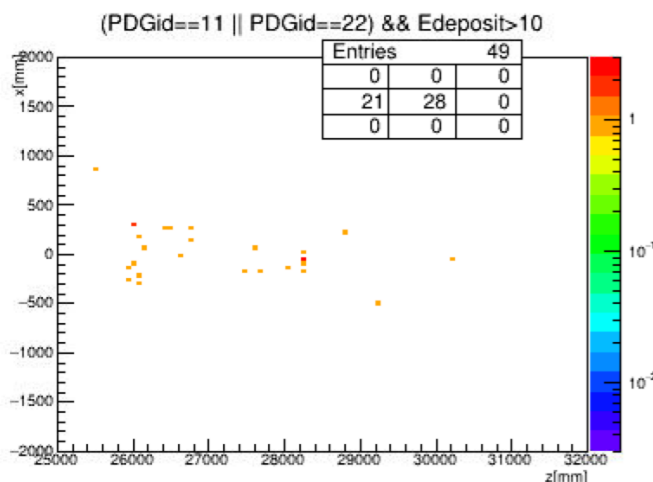
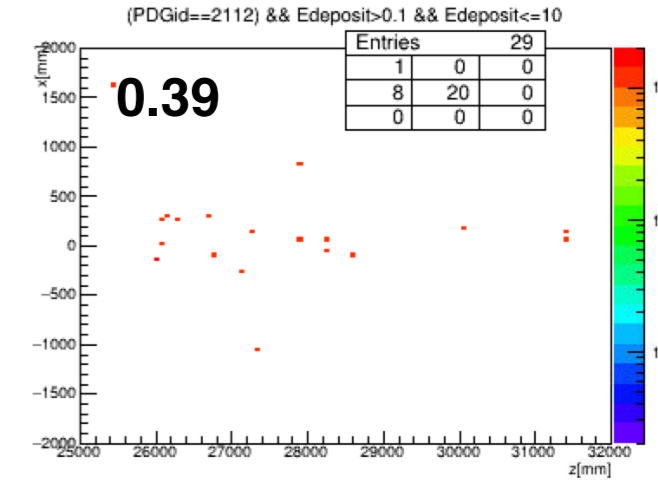
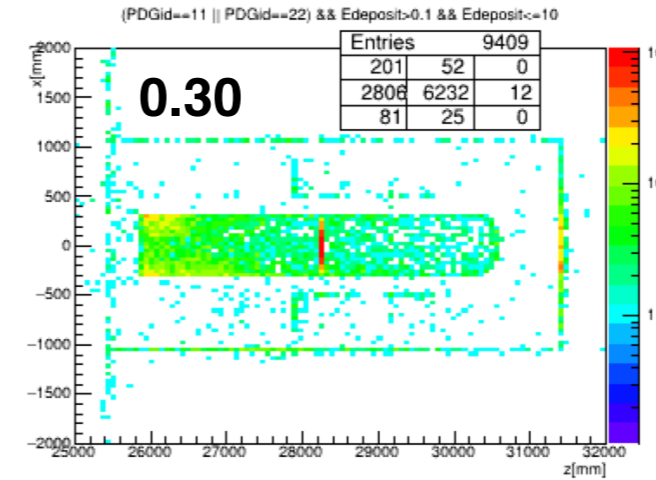
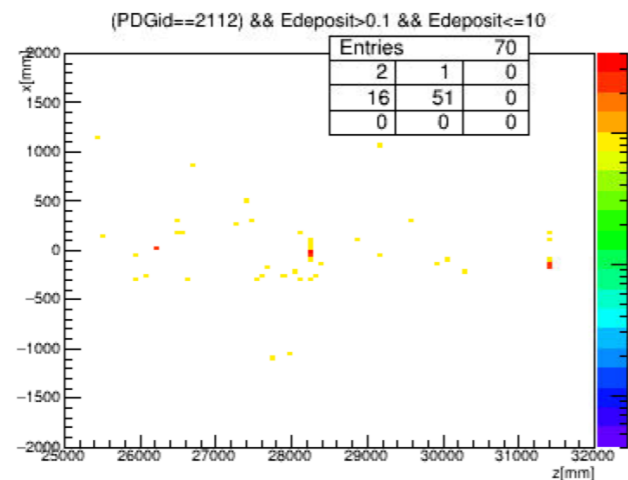
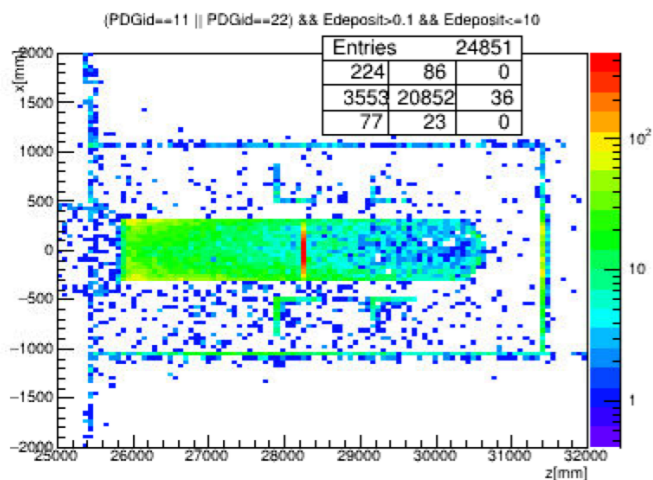
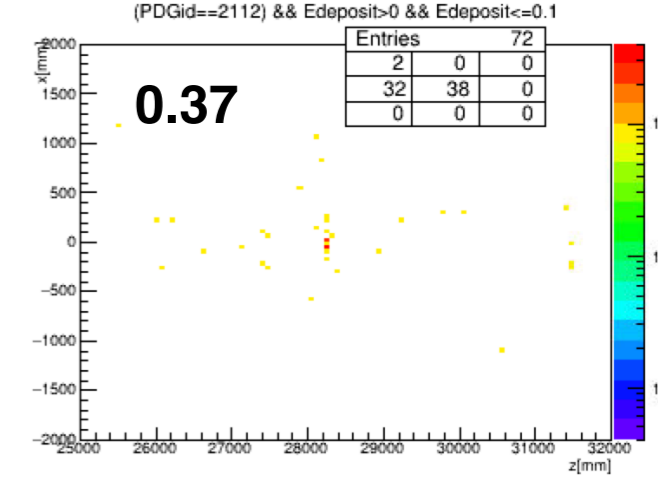
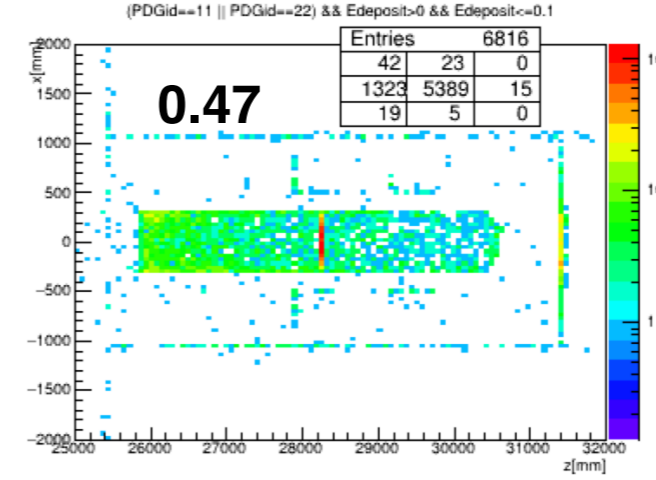
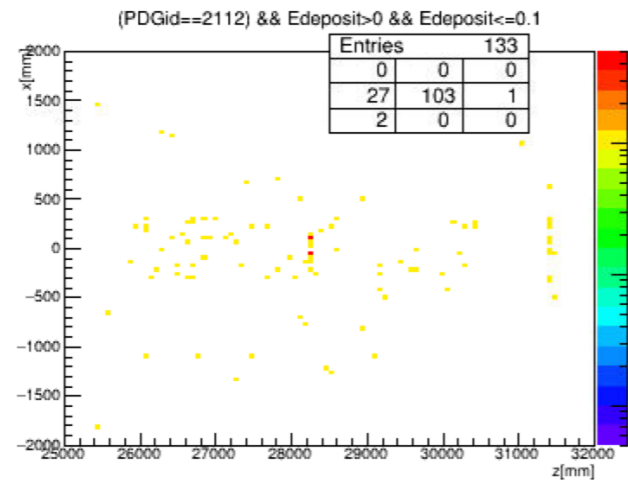
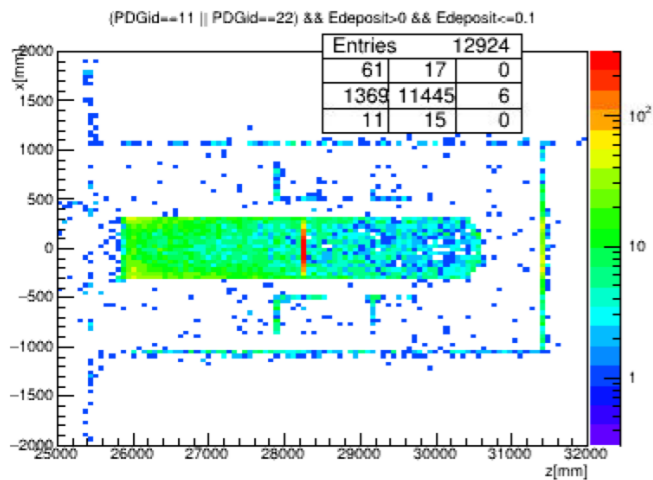


current setup + 1 ft concrete shield



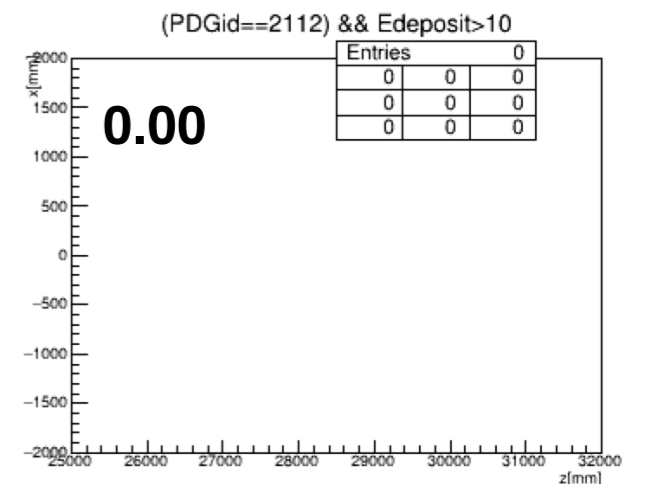
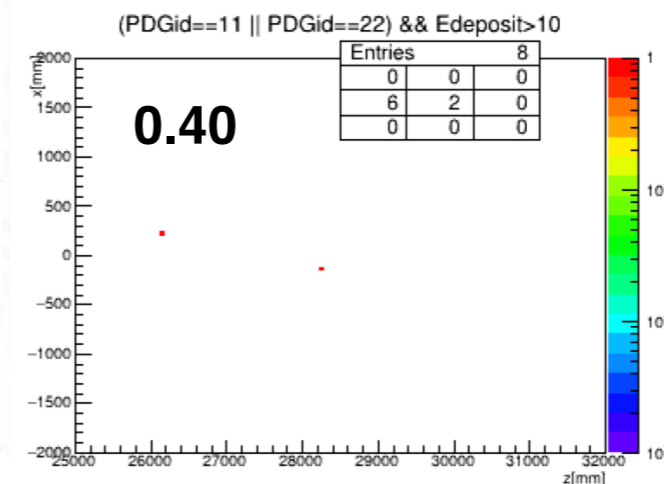
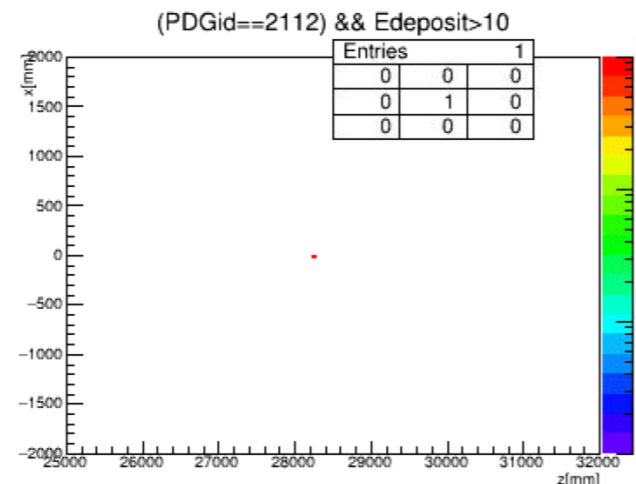
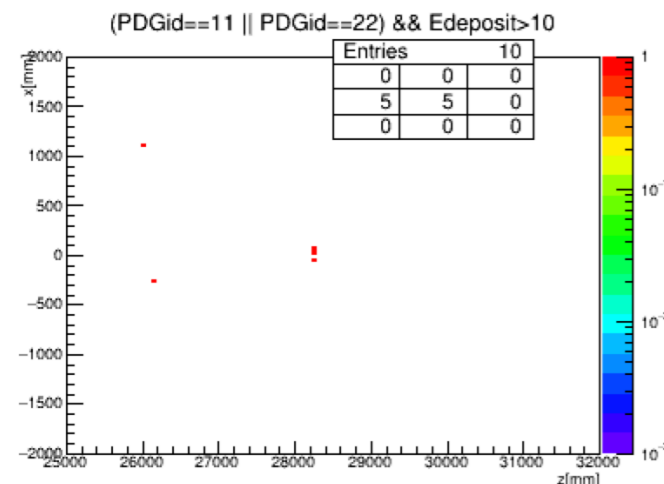
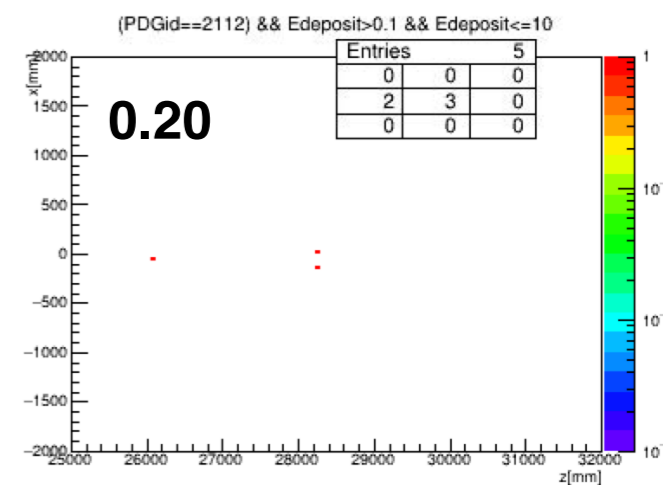
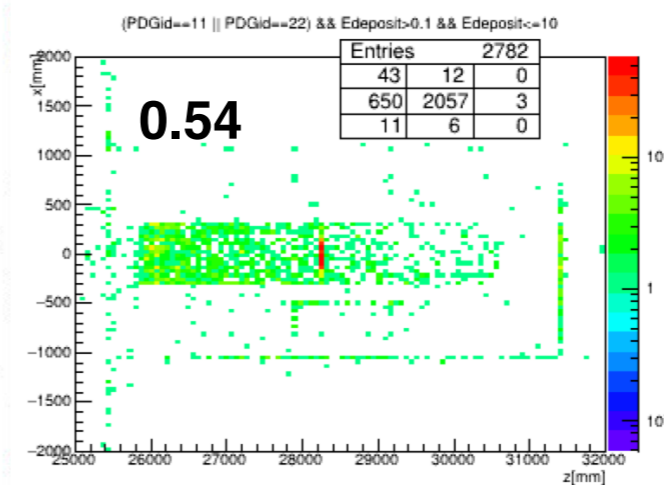
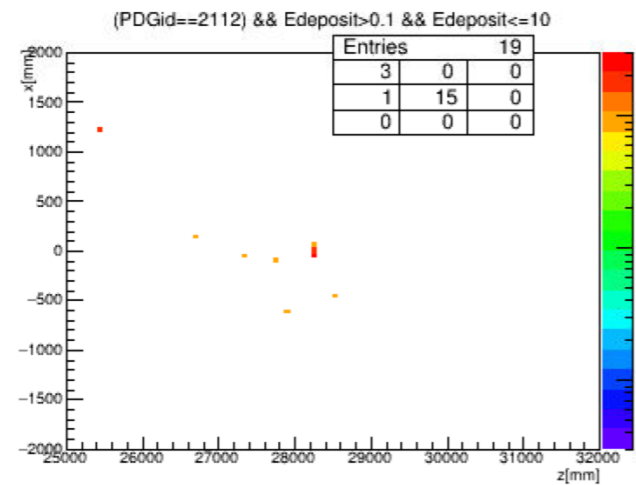
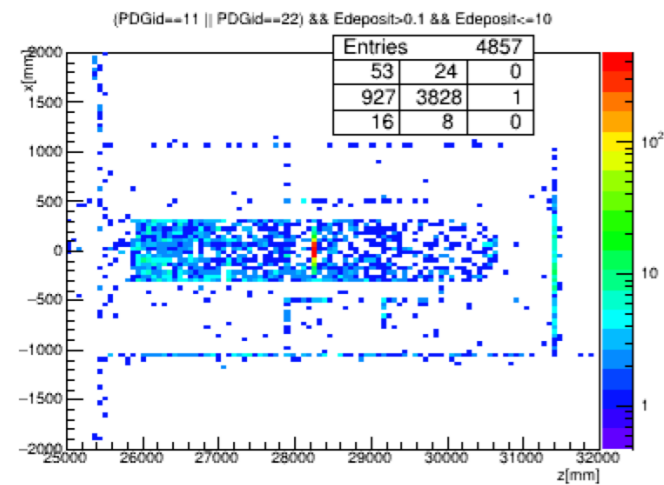
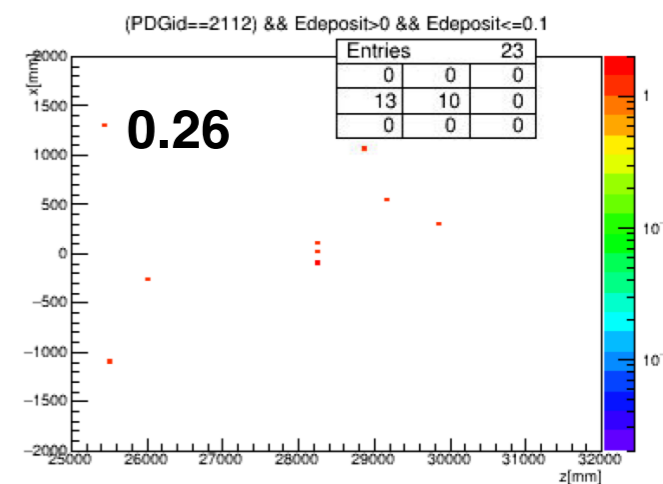
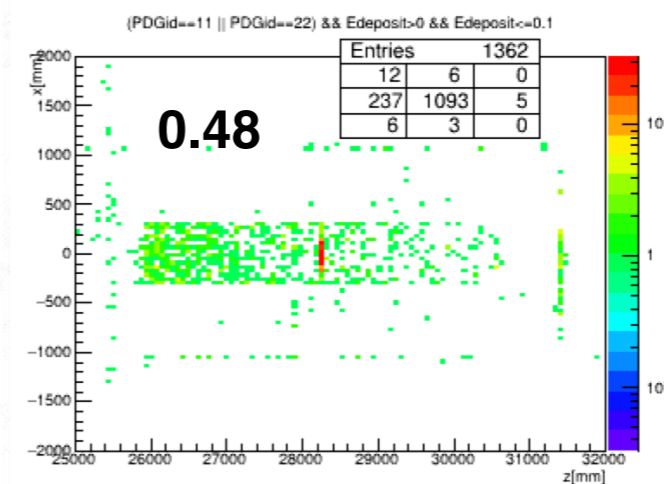
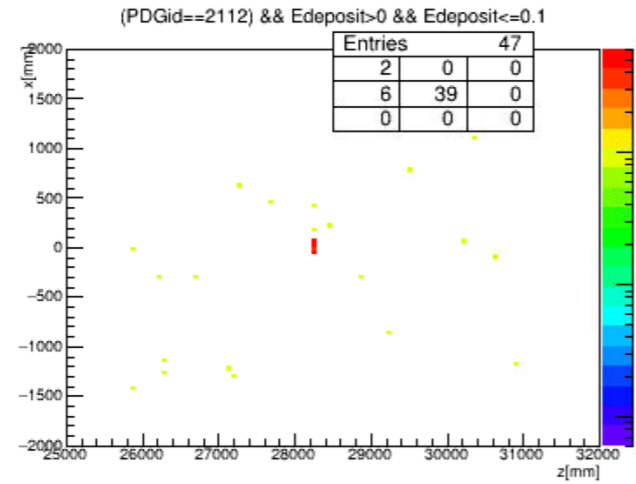
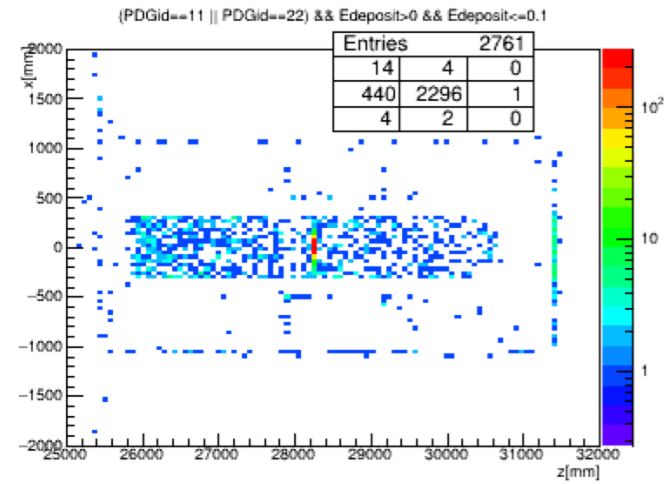
PREX2 - comparison

current setup



CREX - comparison

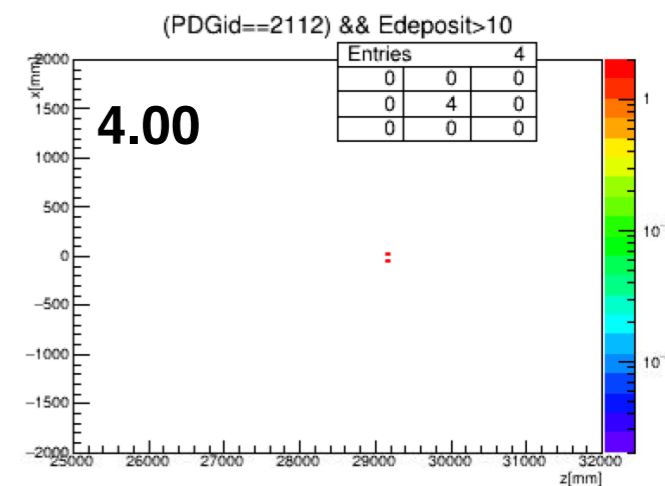
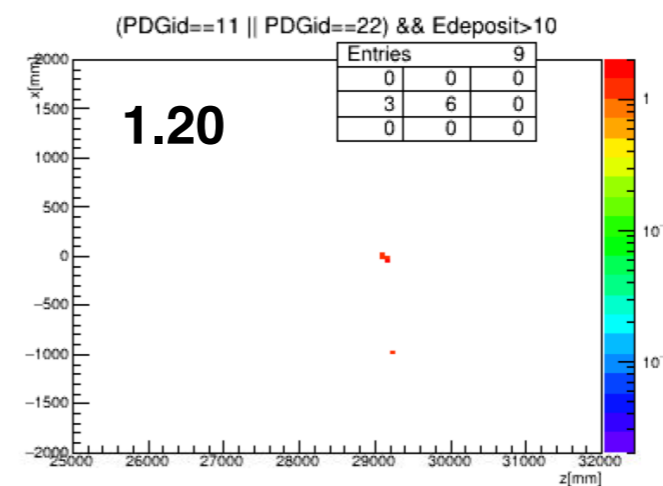
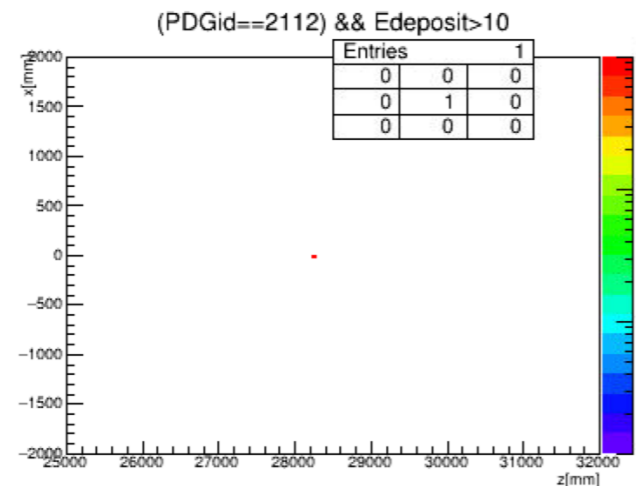
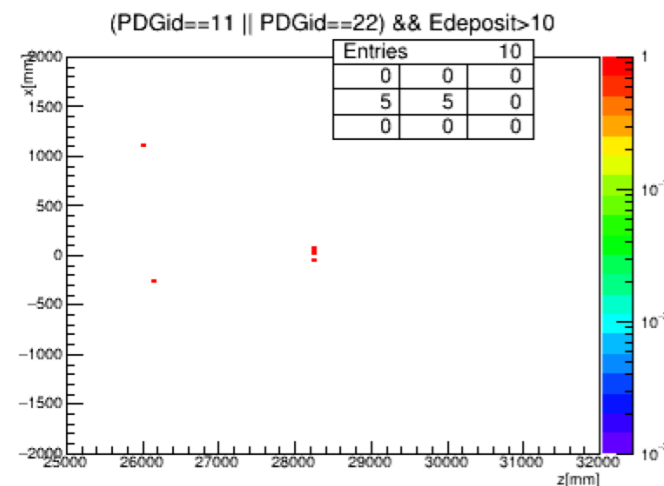
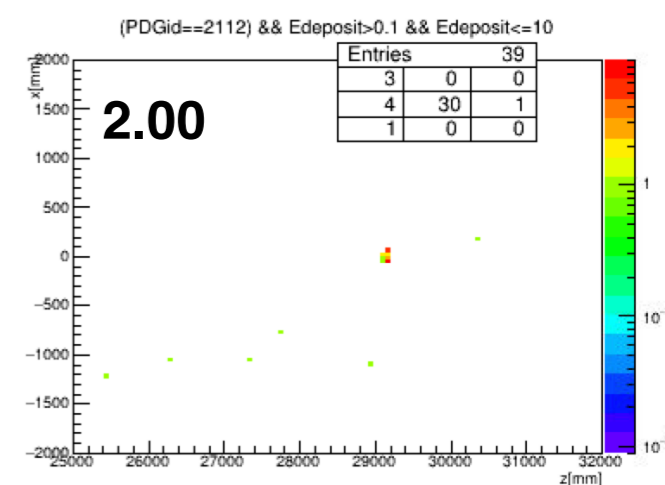
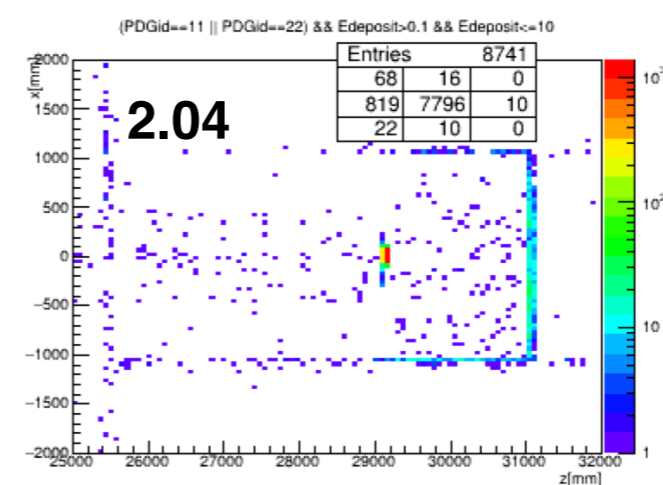
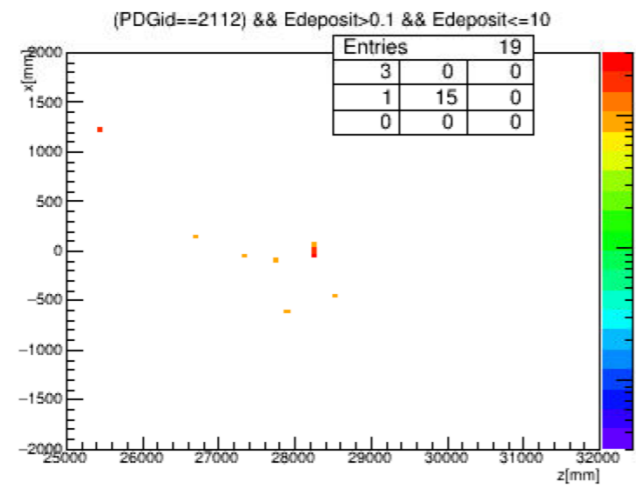
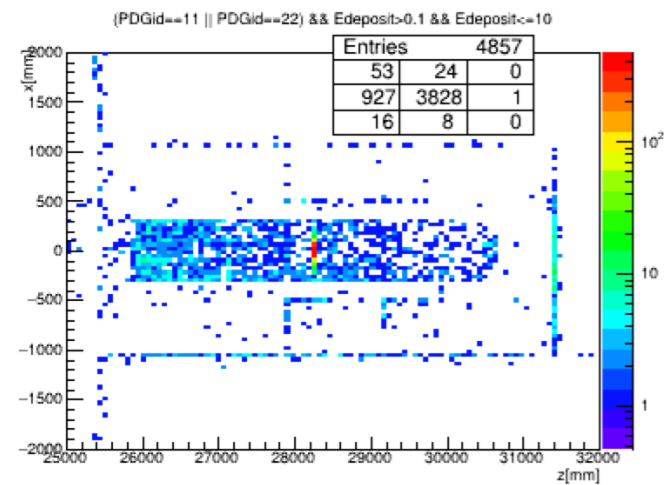
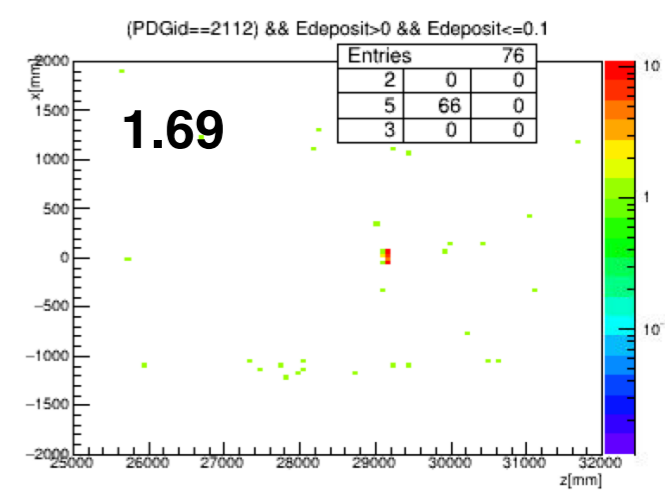
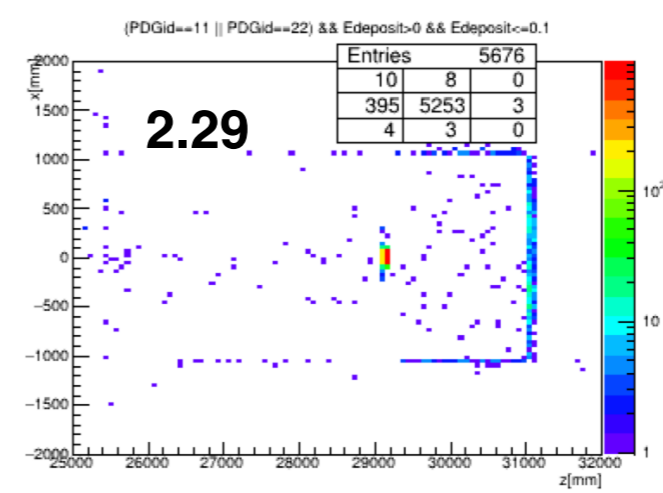
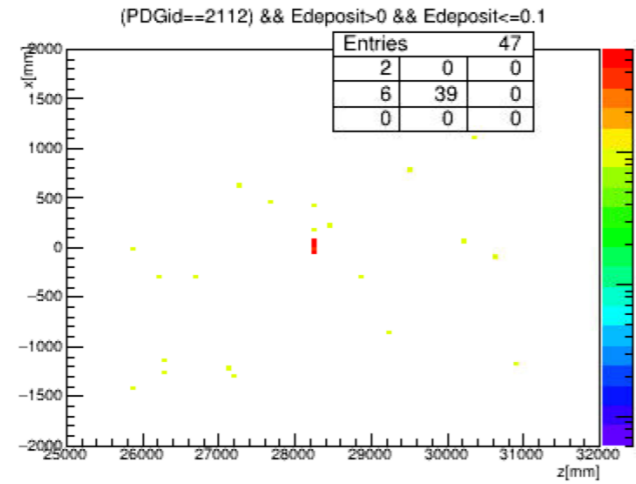
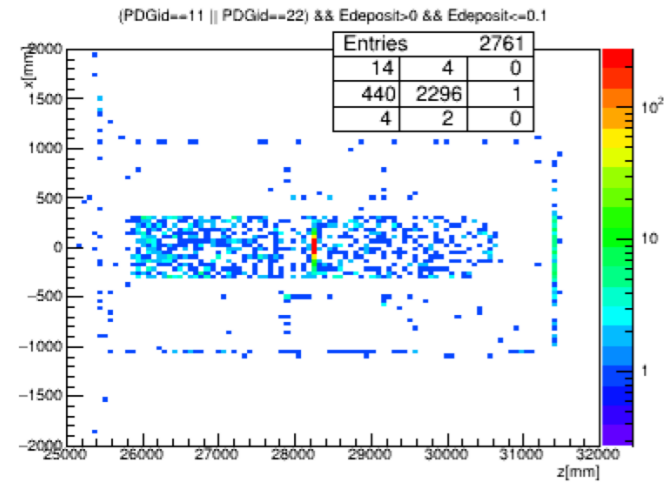
current setup



current setup + 4 in donut

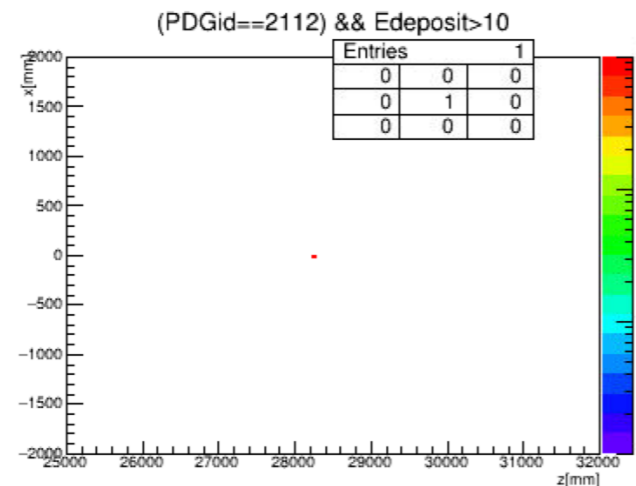
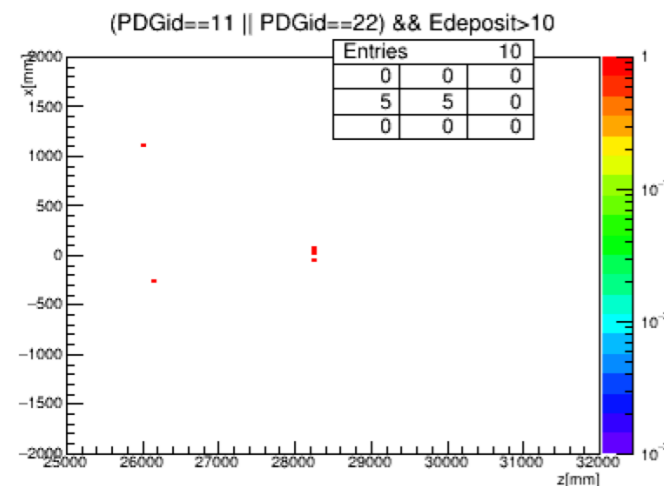
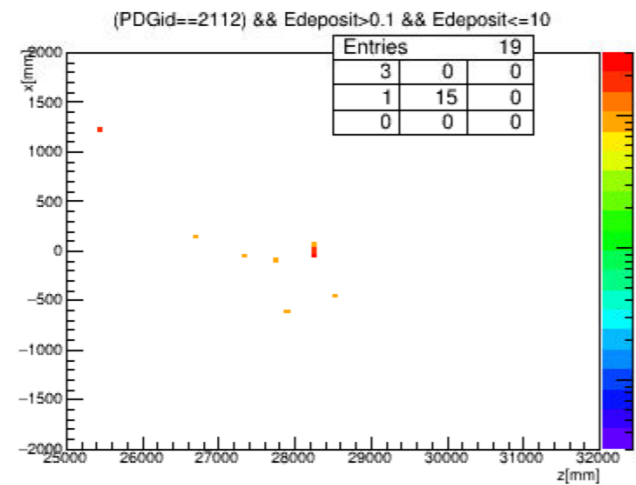
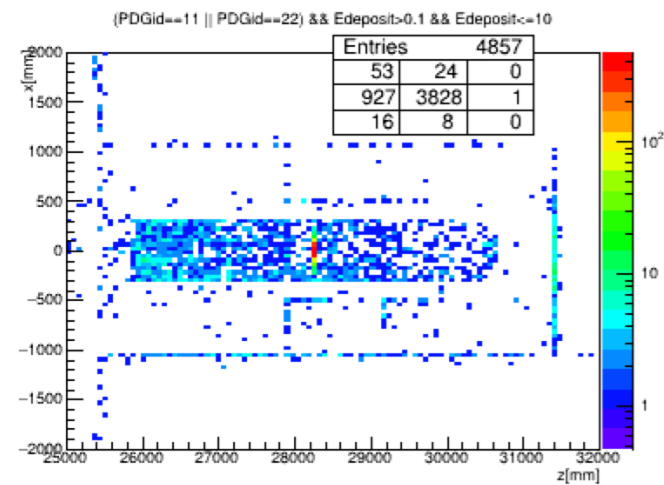
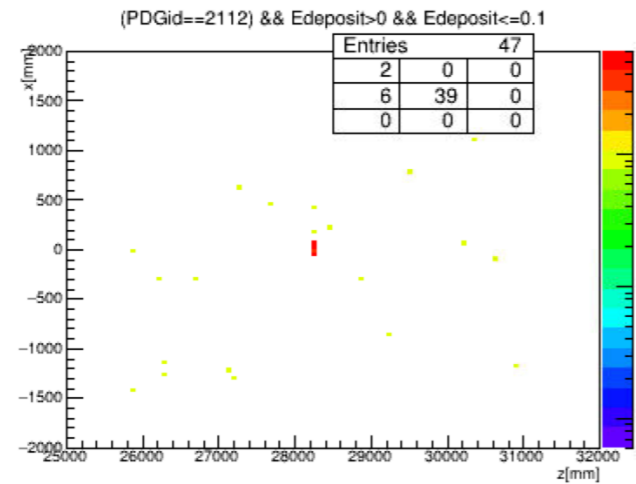
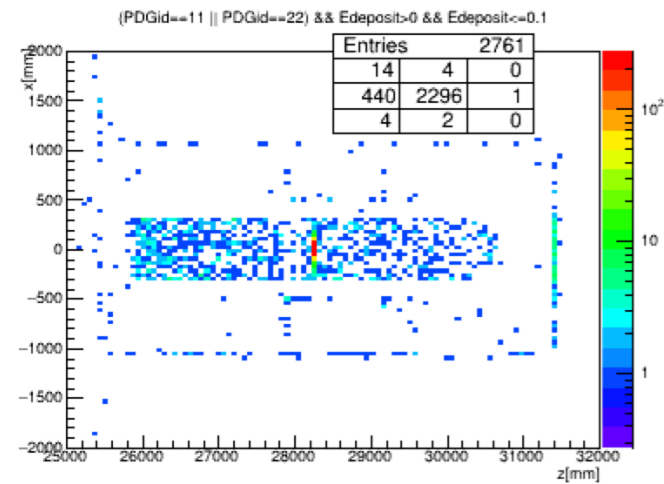
CREX - comparison

current setup

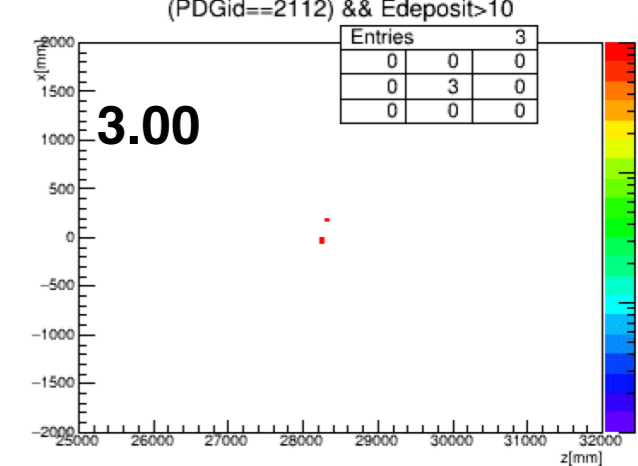
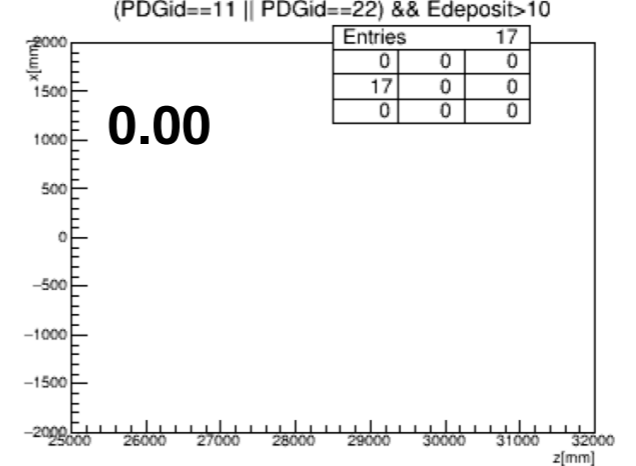
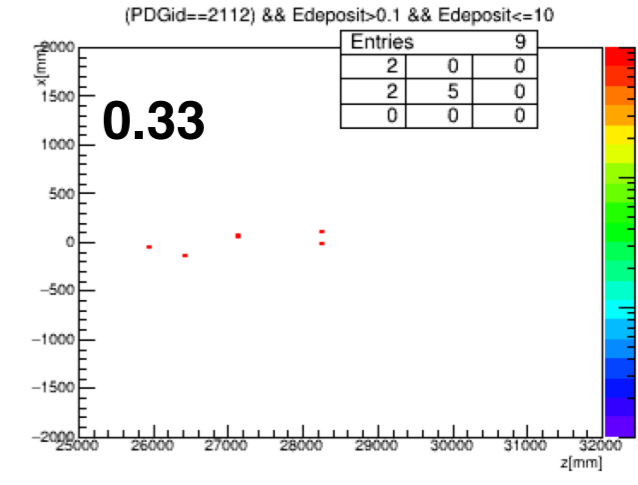
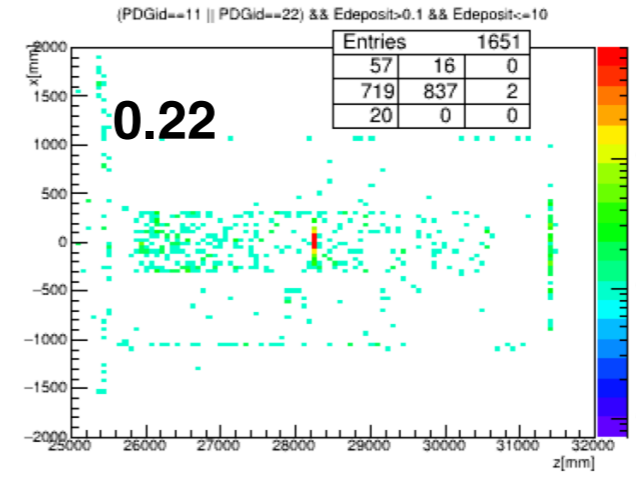
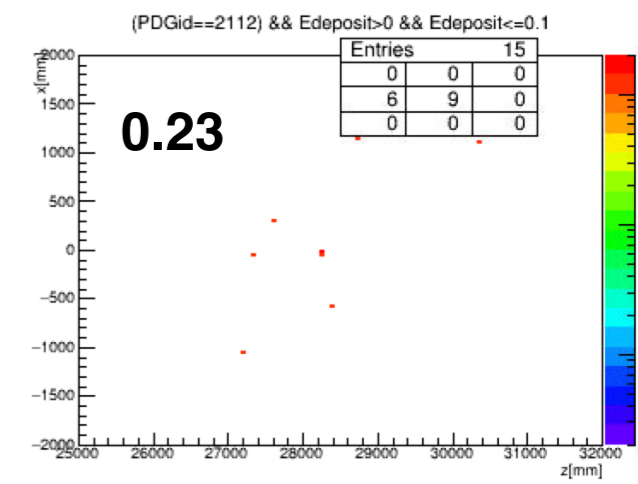
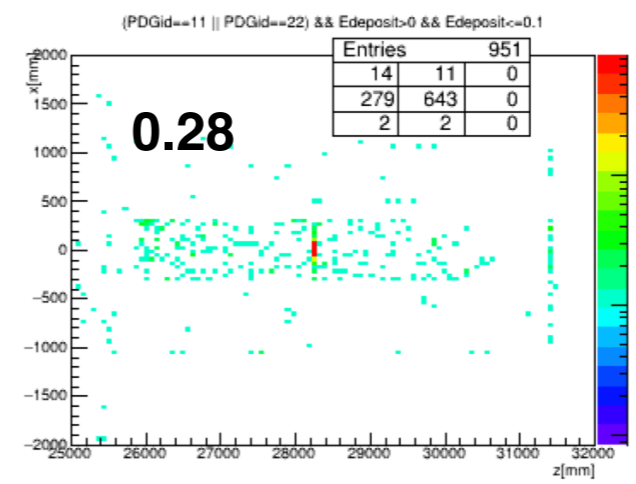


CREX - comparison

current setup

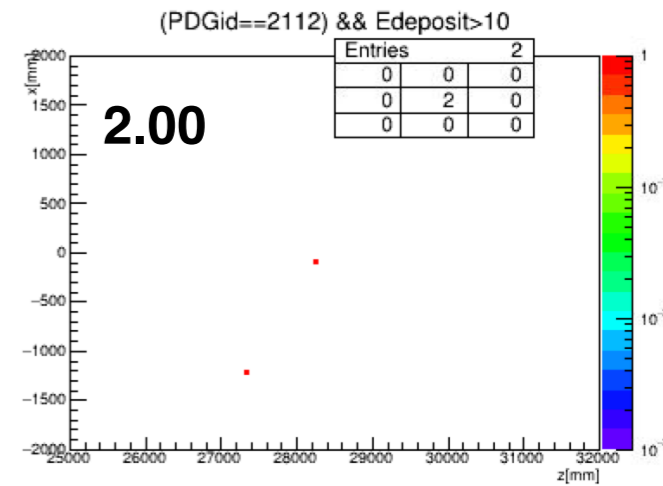
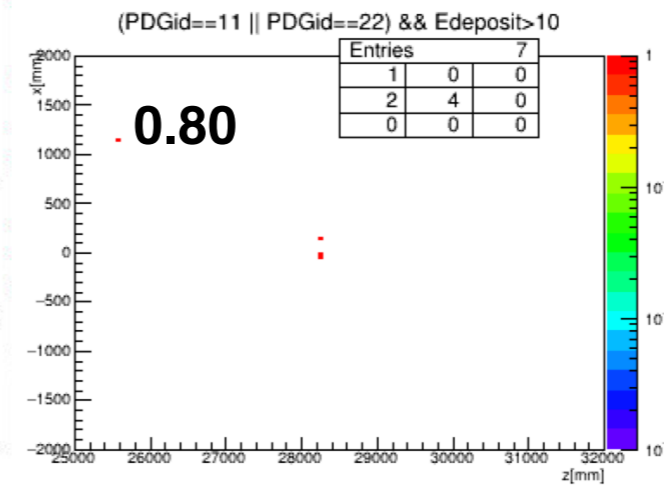
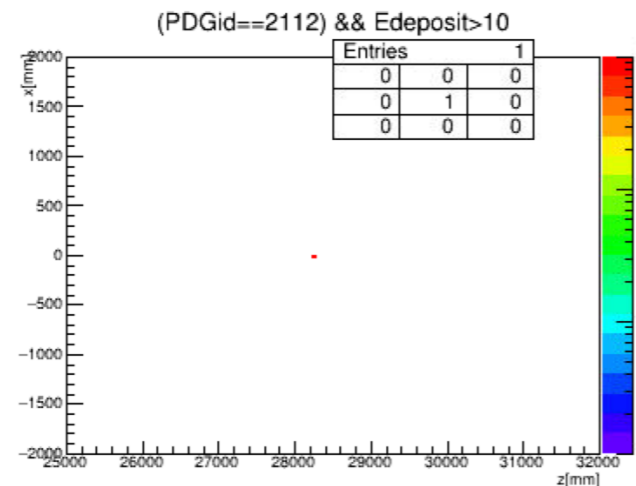
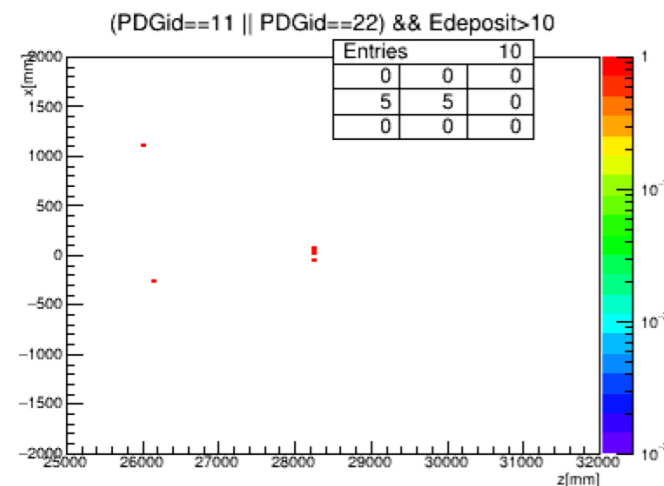
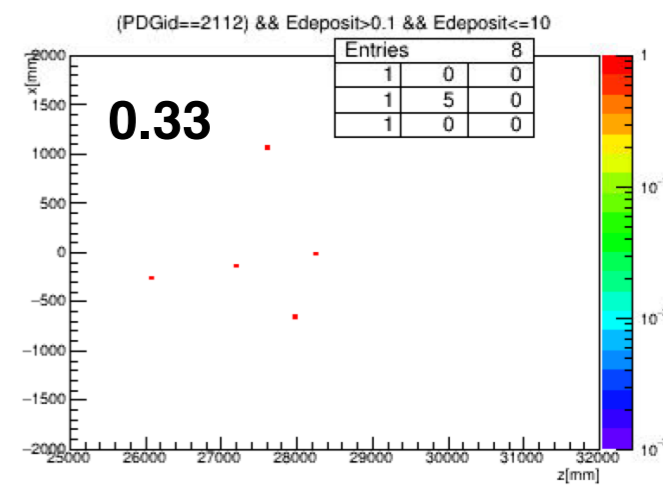
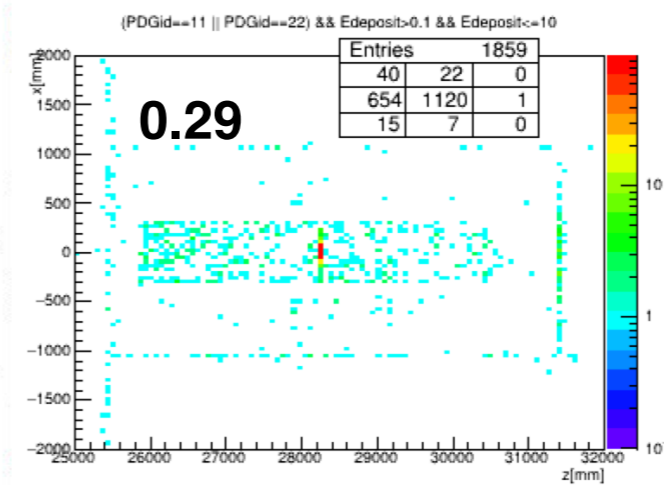
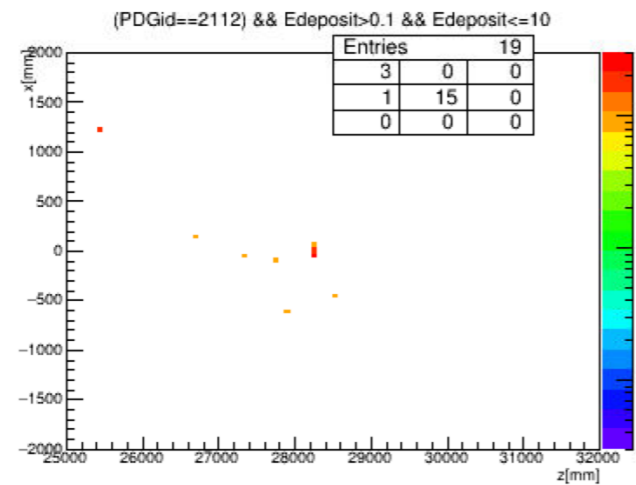
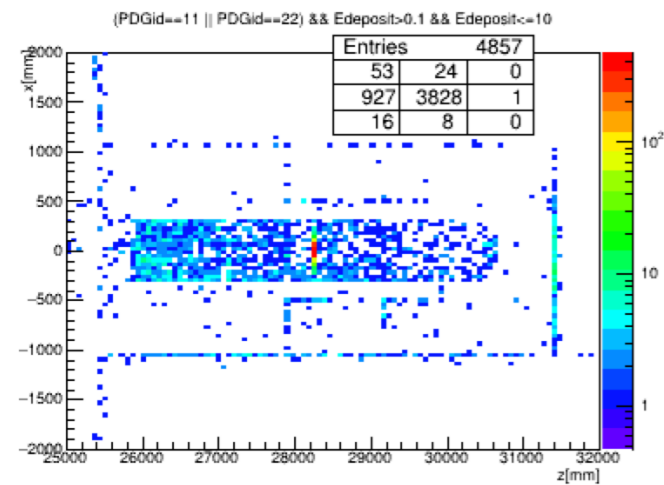
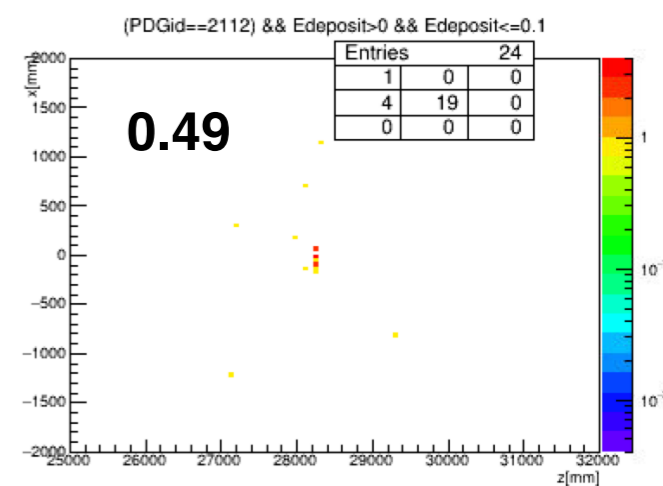
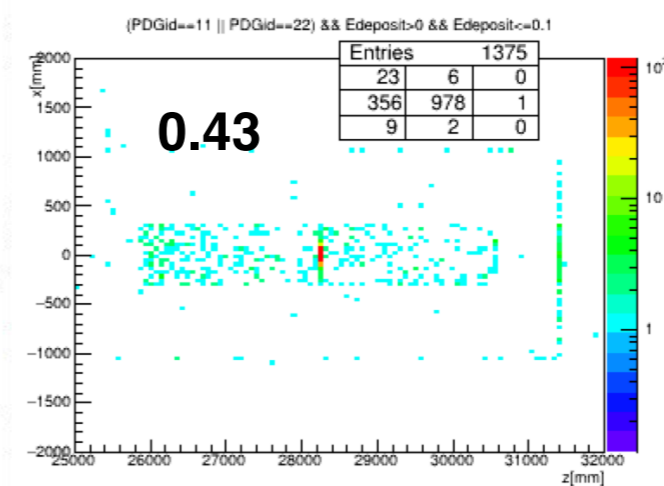
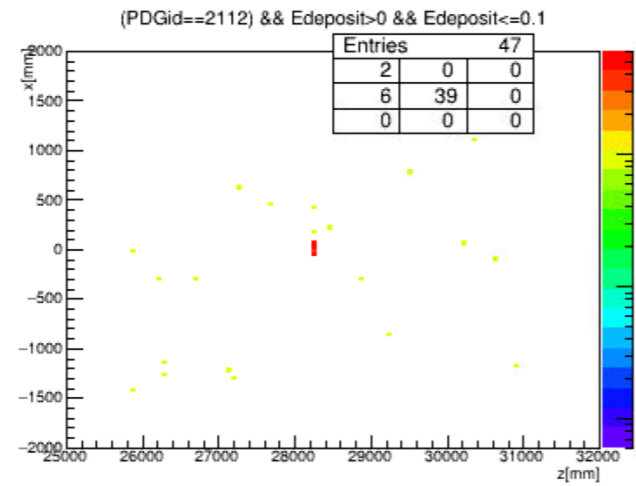
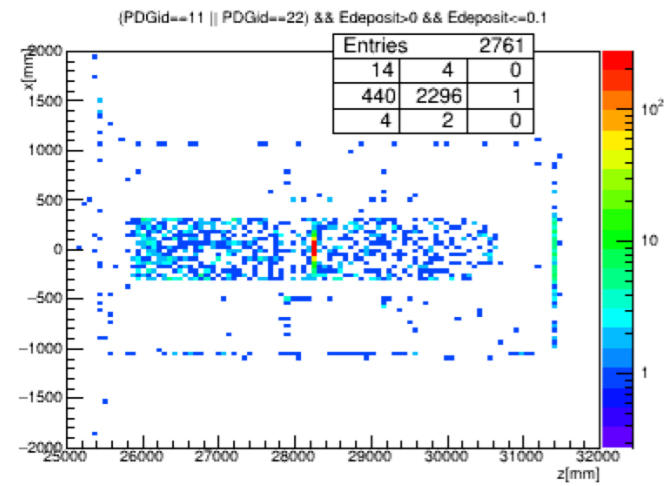


current setup + 1 ft concrete shield



CREX - comparison

current setup



current setup + 1 ft Poly shield